

## 2.0 ALTERNATIVES

### NEPA AND CEQA REQUIREMENTS REGARDING ALTERNATIVES

NEPA and CEQA require that an EIS or EIR, respectively, analyze the impacts of a proposed action and alternatives to the action. NEPA's requirements for an alternatives analysis are found in the CEQ NEPA Regulations (40 C.F.R. 1502.14) and CEQA's are found in section 15126.6 of the State CEQA Guidelines. NEPA requires an EIS to rigorously explore and objectively evaluate all reasonable alternatives that meet the proposed action's purpose and need, including those that are not within the jurisdiction of the lead agency. Reasonable alternatives are those that can be carried out based on technical, economic, and environmental factors, as well as common sense (40 C.F.R. 1502.14; Forty Most Asked Questions Concerning CEQ's NEPA Regulations No. 2a). The CEQ Regulations also indicate that a potential conflict with local or Federal law does not necessarily render an alternative unreasonable, although such conflicts must be considered (40 C.F.R. 1506.2[d]; Forty Questions No. 2b). The EIS must also briefly explain the reasons for eliminating alternatives from detailed study.

Reclamation's Draft NEPA Handbook (2000a) references the CEQ Regulations and indicates that alternatives should take distinctly different approaches and may emphasize the achievement of some objectives at the expense of others. Any reasonable alternative with anticipated environmental consequences that differ significantly from the preferred alternative should be considered a major alternative and analyzed fully.

CEQA requires that EIRs examine a reasonable range of alternatives to the project or to the location of the project that would feasibly obtain most of the basic project objectives, but would avoid or substantially lessen one or more of the significant environmental impacts of the project. Project alternatives must be feasible based on specific economic, social, legal, and technical considerations. The EIR must explain the rationale for selecting the alternatives to be discussed, identify those that were eliminated as infeasible, and briefly explain why they were eliminated. The range of alternatives required in an EIR is governed by a "rule of reason," which requires the EIR to set forth only those alternatives necessary to permit a reasoned choice. The EIR need examine in detail only the ones that the lead agency determines could feasibly attain most of the project objectives (State CEQA Guidelines section 15126.6[f]). An EIR need not consider an alternative whose effects cannot be reasonably ascertained and whose implementation is remote and speculative (State CEQA Guidelines section 15126.6[f][3]).

Both NEPA (C.F.R. 1502.14[d]) and CEQA (State CEQA Guidelines section 15126.6[e]) require that the no action alternative be analyzed in order to provide a comparison of the conditions that would occur with and without the implementation of the proposed action or other alternatives. Reclamation's NEPA Handbook defines "no action" as the projection of current conditions to the most reasonable future responses or conditions that could occur during the life of the project without the proposed action or other proposed action alternatives being implemented. The State CEQA Guidelines (section 15126.6[e][1]) indicate that the no action alternative is not the baseline for determining whether the proposed action's environmental impacts may be significant unless it is identical to the existing environmental setting. The State CEQA Guidelines (section 15126.6[3][2]) further indicate that the no action analysis shall discuss the existing conditions at the time the NOP is published, as well as what would be reasonably

expected to occur in the foreseeable future if the action were not approved, based on current plans and consistent with available infrastructure and community services.

### GOALS AND OBJECTIVES FOR THE CONSERVATION PLAN

In developing the Conservation Plan, the LCR MSCP participants identified a set of goals and objectives that they expect to achieve through its implementation. The goals and objectives are as follows:

1. Conserve habitat that may be impacted by the covered activities that the LCR MSCP participants would implement or perform on the LCR;
2. Reduce the likelihood of additional species listings on the LCR under the ESA;
3. Contribute to recovery of listed species on the LCR;
4. Accommodate current water diversions and power production on the LCR;
5. Optimize opportunities for future water and power development on the LCR;
6. Provide the basis for take authorizations for Federal and non-Federal covered activities on the LCR pursuant to the ESA;
7. Provide the basis for assurances for the non-Federal parties pursuant to the ESA against requirements for increased conservation and mitigation measures in the event of changed circumstances or unforeseen circumstances to the maximum extent permitted by law;
8. Comply with the Law of the River;
9. Identify and implement feasible conservation and mitigation measures for the program based on specific economic, social, legal, and technical considerations, including:
  - a. Whether an alternative's costs would be prohibitively or substantially greater than other alternatives.
  - b. Whether the alternative is technically feasible based on current science or technology, proximity to existing populations of the species, the presence or absence of infrastructure necessary to implement the measures, and the ability to integrate created habitat with existing habitat.

The Conservation Plan must also meet the criteria for issuance of a section 10(a)(1)(B) permit by the Service:

1. The taking will be incidental to an otherwise lawful activity;
2. The applicant will, to the maximum extent practicable, minimize and mitigate the impacts of such taking;
3. The applicant will develop an HCP and ensure that adequate funding for the HCP will be provided;
4. The taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild; and

5. The applicant agrees to implement other measures the Service may require as being necessary or appropriate for the purpose of the HCP.

## SCREENING CRITERIA

Criteria to screen project alternatives were established based on the State CEQA Guidelines and CEQ NEPA Regulations. To be considered in detail, alternatives should:

- Meet most project goals and objectives;
- Reduce or avoid the significant effects of the proposed action; and
- Minimize the creation of new, significant environmental effects.

The following sections describe both the alternatives that have been carried forward for detailed analysis, as well as those that were eliminated.

## 2.1 ALTERNATIVES CARRIED FORWARD FOR DETAILED ANALYSIS

### 2.1.1 Alternative 1: Implementation of Proposed Conservation Plan and Issuance of Section 10(a)(1)(B) Permit (Conservation Plan)

#### 2.1.1.1 Overview

##### *Proposed Action*

Alternative 1 is the proposed action and includes two primary components:

1. Implementation of a regional Conservation Plan by Federal and non-Federal participants that would meet the LCR MSCP goals and objectives.
2. Issuance of an ESA section 10(a)(1)(B) permit by the Service based on the proposed HCP for non-Federal covered activities described in section 1.2.2.2.

##### *Covered and Evaluation Species*

Species proposed for coverage are those that meet one of the following selection criteria:

- Species that are listed or that are proposed or candidates for listing under the ESA or species that are protected under Arizona, California, or Nevada law that could be affected by covered activities and would require take authorization.
- Species that could become listed during the term of the LCR MSCP Conservation Plan under the ESA or species that could become protected under Arizona, California, or Nevada law that could be affected by covered activities and could require future take authorization.

The Conservation Plan includes a full range of conservation measures for all covered species. Based on application of the selection criteria, 27 of the species considered are proposed for coverage under the ESA section 10(a)(1)(B) permit (Table 2.1-1). The LCR MSCP HCP also includes four “evaluation species.” Evaluation species are species that could become listed in

**Table 2.1-1. Proposed Covered and Evaluation Species and  
Their Status Under the Conservation Plan (page 1 of 2)**

Common and Scientific Name	Federal Status <sup>1</sup>	Arizona Status <sup>2</sup>	California Status <sup>3</sup>	Nevada Status <sup>4</sup>	Selection Criteria <sup>5</sup>
THREATENED AND ENDANGERED SPECIES					
Yuma clapper rail <i>Rallus longirostris yumanensis</i>	FE	ASC	CT/FP	-	1
Southwestern willow flycatcher <i>Empidonax trailii extimus</i>	FE	ASC	CE	-	1
Desert tortoise (Mojave population) <i>Gopherus agassizii</i>	FT	ASC	CT	NT	1
Bonytail <i>Gila elegans</i>	FE	ASC	CE	NE	1
Humpback chub <i>Gila cypha</i>	FE	ASC	-	-	1
Razorback sucker <i>Xyrauchen texanus</i>	FE	ASC	CE/FP	NE	1
OTHER COVERED SPECIES					
Western red bat <i>Lasiurus blossevillei</i>	-	ASC	-	-	2
Western yellow bat <i>Lasiurus xanthinus</i>	-	ASC	-	-	2
Desert pocket mouse <i>Chaetodipus penicillatus sobrinus</i>	-	-	-	-	2
Colorado River cotton rat <i>Sigmodon arizonae plenus</i>	-	-	CSC	-	2
Yuma hispid cotton rat <i>Sigmodon hispidus eremicus</i>	-	-	CSC	-	2
Western least bittern <i>Ixobrychus exilis hesperis</i>	-	ASC	CSC	-	2
California black rail <i>Laterallus jamaicensis coturniculus</i>	-	ASC	CT/FP	-	1
Yellow-billed cuckoo <i>Coccyzus americanus occidentalis</i>	FC	ASC	CE	-	1
Elf owl <i>Micrathene whitneyi</i>	-	-	CE	NP	1
Gilded flicker <i>Colaptes chrysoides</i>	-	-	CE	-	1
Gila woodpecker <i>Melanerpes uropygialis</i>	-	-	CE	-	1
Vermilion flycatcher <i>Pyrocephalus rubinus</i>	-	-	CSC	-	2
Arizona Bell's vireo <i>Vireo bellii arizonae</i>	-	-	CE	-	1
Sonoran yellow warbler <i>Dendroica petechia sonorana</i>	-	-	CSC	-	2
Summer tanager <i>Piranga rubra</i>	-	-	CSC	-	2

**Table 2.1-1. Proposed Covered and Evaluation Species and their Status Under the Conservation Plan (page 2 of 2)**

Common and Scientific Name	Federal Status <sup>1</sup>	Arizona Status <sup>2</sup>	California Status <sup>3</sup>	Nevada Status <sup>4</sup>	Selection Criteria <sup>5</sup>
Flat-tailed horned lizard <i>Phrynosoma mcalli</i>	–	ASC	CSC	–	2
Relict leopard frog <i>Rana onca</i>	FC	ASC	–	NP	1
Flannelmouth sucker <i>Catostomus latipinnis</i>	–	ASC	–	–	2
MacNeill's sootywing skipper <i>Pholisora graciellae</i>	–	–	–	–	2
Sticky buckwheat <i>Eriogonum viscidulum</i>	–	–	–	NEP	1
Threecorner milkvetch <i>Astragalus geyeri</i> var. <i>triquetrus</i>	–	–	–	NEP	1
EVALUATION SPECIES					
California leaf-nosed bat <i>Macrotus californicus</i>	–	ASC	CSC	–	N/A
Pale Townsend's big-eared bat <i>Corynorhinus townsendii pallescens</i>	–	–	CSC	–	N/A
Colorado River toad <i>Bufo alvarius</i>	–	–	CSC	–	N/A
Lowland leopard frog <i>Rana yavapaiensis</i>	–	ASC	CSC	–	N/A
<p>1 Federal Status</p> <p>FE = Listed as endangered under the Federal ESA.</p> <p>FT = Listed as threatened under the ESA.</p> <p>FC = Candidate for listing under the ESA.</p> <p>2 Arizona Status</p> <p>ASC = Arizona wildlife of special concern.</p> <p>3 California Status</p> <p>CE = Listed as endangered under CESA</p> <p>CT = Listed as threatened under CESA.</p> <p>FP = Fully protected under the California Fish and Game Code.</p> <p>CSC = California species of special concern.</p> <p>4 Nevada Status</p> <p>NE = Nevada endangered</p> <p>NT = Nevada threatened.</p> <p>NEP = Nevada critically endangered plant.</p> <p>NP = Nevada protected.</p> <p>5 Selection Criteria</p> <p>1. Species that are listed or that are proposed or candidates for listing under the ESA or species that are protected under Arizona, California, or Nevada law that could be affected by covered activities and would require take authorization;</p> <p>2. Species that could become listed during the term of the LCR MSCP under the ESA or species that could become protected under Arizona, California, or Nevada law that could be affected by covered activities and could require future take authorization. Factors considered to determine potential for future listing during the term of the LCR MSCP are:</p> <ul style="list-style-type: none"> <li>• ongoing or likely future destruction, modification, or curtailment of a species' habitat or range of sufficient magnitude that could warrant future listing;</li> <li>• the inadequacy of existing regulatory mechanisms to protect a species from ongoing decline of sufficient magnitude that could warrant future listing; or</li> <li>• other natural or artificial factors that may affect a species' continued existence.</li> </ul> <p>N/A = Not applicable.</p>					

future years and that could be added to the covered species list during the term of the LCR MSCP, but for which sufficient information is not available at this time to determine their status in the planning area, the potential effects of covered activities, or to develop specific conservation measures for the species. The Conservation Plan includes research studies and pilot management studies for the evaluation species to determine their status in the planning

1 area and to determine appropriate conservation measures. None of the four evaluation species  
2 are presently protected under the ESA.

### 3 *Covered Activities*

4 The covered activities for which the LCR MSCP participants are requesting incidental take  
5 authorizations and permits are briefly described in section 1.2.2, and are described more fully in  
6 Chapters 2 of the LCR MSCP BA and LCR MSCP HCP. The impacts to covered species' habitat  
7 that are likely to result from the covered activities and the implementation of the proposed  
8 Conservation Plan are shown in Table 2.1-2. Table 2.1-3 summarizes all impacts on covered and  
9 evaluation species and the expected level of take associated with implementing covered  
10 activities and the Conservation Plan.

### 11 *Conservation Measures*

12 The Conservation Plan includes the following types of conservation measures that, in  
13 combination, would achieve program objectives for regulatory compliance and contribute to  
14 species' recovery:

- 15 • Establishment of a \$25 million fund to support projects implemented by land use  
16 managers in the planning area that maintain existing habitat for listed species that  
17 would be covered by the Conservation Plan under this alternative;
- 18 • Creation of native land cover types (5,940 acres of cottonwood-willow, 1,320 acres of  
19 honey mesquite type III, 512 acres of marsh, and 360 acres of backwaters) to provide  
20 covered species habitats;
- 21 • Avoidance and minimization of impacts on covered species and their habitat resulting  
22 from covered activities and Conservation Plan implementation;
- 23 • Population enhancement measures that directly or indirectly increase abundance of  
24 covered species;
- 25 • Monitoring and research necessary to assess and improve conservation measure  
26 effectiveness and adaptively manage implementation of the Conservation Plan over  
27 time; and
- 28 • Other conservation measures relating to the covered species and the strategies for  
29 implementing them.

30 The Conservation Plan is designed to fully mitigate adverse effects on all covered species  
31 resulting from covered activities described in section 1.2.2 and to meet the ESA section 10  
32 standard to minimize and mitigate the impacts of the covered activities on covered species to  
33 the maximum extent practicable [50 C.F.R. 17.22(b)(2)(B)]. Specific conservation measures are  
34 listed in Table 2.1-3 and described more fully later in section 2.1.1.5.

### 35 *Science Strategy*

36 The LCR MSCP is a multi-faceted, long-range program to conserve covered species that are  
37 dependent on the aquatic, wetland, and riparian environments present within the LCR  
38 floodplain. In general, these species are rare, their habits and habitats are not well known, and  
39 experience in development and creation of their habitats and management of their populations

is limited. The LCR MSCP has used the best available scientific information to develop the Conservation Plan and would use sound scientific principles and standards to implement the conservation measures.

**Table 2.1-2. Comparison of Species-Specific Habitat Impacts to Created LCR MSCP Habitat (in Acres) (Page 1 of 2)**

<i>Covered Species</i>	<i>Impacts of Federal and Non-Federal Flow-Related Covered Activities<sup>a</sup></i>	<i>Impacts of Federal and Non-Federal Non-Flow-Related Covered Activities<sup>a</sup></i>	<i>Total Impacts</i>	<i>LCR MSCP Created Habitat</i>
<b>THREATENED AND ENDANGERED SPECIES</b>				
Yuma clapper rail	133	110	243	512
Southwestern willow flycatcher	1,784	69	1,853	4,050
Desert tortoise (Mojave population)	0	192	192	0 <sup>b</sup>
Bonytail	399	0	399	360 <sup>c</sup>
Humpback chub	ND <sup>d</sup>	0	ND <sup>d</sup>	ND <sup>d</sup>
Razorback sucker	399	0	399	360 <sup>c</sup>
<b>OTHER COVERED SPECIES</b>				
Western red bat (roosting habitat)	161	604	765	765
Western yellow bat (roosting habitat)	161	604	765	765
Desert pocket mouse	0	0	0	0
Colorado River cotton rat	59	8	67	125
Yuma hispid cotton rat	0	71	71	76
Western least bittern	133	110	243	512
California black rail	37	66	103	130
Yellow-billed cuckoo	1,425	109	1,534	4,050
Elf owl	161	590	751	1,784
Gilded flicker	1,425	109	1,534	4,050
Gila woodpecker	819	36	855	1,702
Vermilion flycatcher	1,890	724	2,614	5,208
Arizona Bell's vireo	1,654	1,329 <sup>e</sup>	2,983 <sup>e</sup>	2,983
Sonoran yellow warbler	2,929	193	3,122	4,050
Summer tanager	161	14	175	602
Flat-tailed horned lizard	0	128	128	0 <sup>f</sup>
Relict leopard frog	0 <sup>g</sup>	0 <sup>g</sup>	0 <sup>g</sup>	0
Flannelmouth sucker	85	0	85	85
MacNeill's sootywing skipper	172	50	222	222
Sticky buckwheat	ND <sup>h</sup>	0	ND <sup>h</sup>	ND <sup>h</sup>
Threecorner milkvetch	ND <sup>h</sup>	0	ND <sup>h</sup>	ND <sup>h</sup>
<b>EVALUATION SPECIES</b>				
California leaf-nosed bat (roosting habitat)	0	0	0	0
Pale Townsend's big-eared bat (roosting habitat)	0	0	0	0
Colorado River toad	0	0	0	0
Lowland leopard frog	0	0	0	0

**Table 2.1-2. Comparison of Species-Specific Habitat Impacts to Created LCR MSCP Habitat (in Acres) (Page 2 of 2)**

Note: LCR MSCP conservation measures to create habitat for covered species would avoid removal of cottonwood-willow, honey mesquite, marsh, and backwater land cover types that provide habitat for covered species, and, therefore, impacts of implementing the LCR MSCP conservation measures are not shown in this table. The LCR MSCP currently estimates that about two-thirds of LCR MSCP created habitat would be created on agricultural lands (5,045 acres), including associated infrastructure (estimated to be 1percent of all habitat created, or 81 acres). Agricultural lands provide little or no habitat value for covered and evaluation species.

The LCR MSCP impact assessment also assumes that up to 512 acres of existing degraded or former marsh that may provide low-value habitat could be converted to create fully functioning marsh that provides high-value Yuma clapper rail, western least bittern, California black rail, and Colorado River cotton rat habitat. Up to 360 acres of existing degraded or former backwaters could also be converted to create fully functioning backwaters that provides high-value habitat for the bonytail, razorback sucker, and flannelmouth sucker. Conversion of existing degraded or former marsh and backwaters to create habitat for these species, however, would not result in a loss of existing habitat.

The remainder of LCR MSCP habitat (currently estimated to be 2,377 acres) would be created on lands that currently support low-value habitats (e.g., saltcedar and saltcedar-dominated land cover types) for one or more covered species. These low-value habitats would be lost and replaced with habitats designed to be of higher value for the covered species. With implementation of the avoidance and minimization measures described in section 2.1.1.5, "Avoidance and Minimization Measures," removal of these low-quality habitats, however, is not expected to result in harm (i.e., injury or mortality of individuals) and, therefore, is not expected to result in take of covered or evaluation species.

- <sup>a</sup> The estimated effects on covered species habitats that will result from implementation of the Federal non-flow-related covered activities are addressed in the LCR MSCP BA. The amount of land cover types to be created or protected to provide covered species habitats described in Table 2.1-5 includes the creation or protection of sufficient land cover to provide covered species habitat to mitigate the impacts of implementing all of the LCR MSCP covered activities, including the Federal non-flow-related activities, on covered species habitats.
- <sup>b</sup> Net loss in habitat is fully mitigated by protecting 230 acres of desert tortoise habitat in accordance with mitigation requirements in the document entitled "Compensation for Desert Tortoise" (Desert Tortoise Compensation Team 1991).
- <sup>c</sup> The effects of the loss of 399 acres of backwater on this species would be fully mitigated by both creating 360 acres of backwater that would be managed to provide greater habitat values for this species and by stocking juvenile fish to substantially augment the existing population over the term of the LCR MSCP (see discussion of bonytail and razorback sucker in section 2.1.1.5, General Species Conservation Measures).
- <sup>d</sup> ND = Not determined. Acres of potentially affected habitat are not calculated. Changes in reservoir elevations associated with implementation of flow-related covered activities, however, could result in the establishment of up to 62 miles of transitory Colorado River channel when the reservoir pool is maintained at lower elevations that could be occupied by humpback chub and subsequently lost when reservoir elevations rise.
- <sup>e</sup> Includes 610 acres of honey mesquite IV that provides Arizona Bell's vireo habitat that could be converted to agricultural uses and that are covered under the LCR MSCP. Up to an additional 3,832 acres of honey mesquite IV that provides habitat could be removed by Federal non-flow-related activities; however, these activities and resultant impacts are not covered under the LCR MSCP.
- <sup>f</sup> Net loss in habitat is fully mitigated by protecting 230 acres of flat-tailed horned lizard habitat in accordance with mitigation requirements in the Flat-Tailed Horned Lizard Rangewide Management Strategy (Flat-tailed Horned Lizard Interagency Coordinating Committee 2003).
- <sup>g</sup> Implementation of covered activities will not result in removal of this species' habitat but could result in temporary disturbance of habitat or affect movement of individuals.
- <sup>h</sup> ND = Not determined. Acres of potentially affected habitat are not calculated. Changes in Lake Mead reservoir elevations associated with implementation of flow-related covered activities, however, would result in periodic loss of habitat that is exposed along the Lake Mead shoreline when reservoir elevations are low and then is subsequently inundated when reservoir elevations rise.



**Table 2.1-3. Summary of Impacts on Covered and Evaluation Species and Estimated Level of Take Associated with Implementation of Flow- and Non-Flow-Related Covered Activities and the Conservation Plan**

<i>Species</i>	<i>Impacts and Estimated Level of Take</i>	<i>Conservation Measures to Avoid, Minimize, and Mitigate Impacts</i>	<i>Summary of Expected Outcomes</i>
<b>THREATENED AND ENDANGERED SPECIES</b>			
Yuma clapper rail	<ul style="list-style-type: none"> <li>▪ Loss of up to 133 acres of habitat associated with implementation of flow-related covered activities</li> <li>▪ Periodic establishment and loss of habitat within the full pool elevation of Lake Mead as a result of fluctuations in reservoir elevation</li> <li>▪ Loss of up to 70 acres of habitat associated with implementation of Federal non-flow-related covered activities<sup>a</sup></li> <li>▪ Potential for loss of up to 10 acres of degraded, low-value habitat associated with non-Federal, non-flow-related, habitat restoration and habitat management activities</li> <li>▪ Potential periodic removal of up to 30 acres of emergent vegetation that could provide habitat along 244 miles of drains</li> <li>▪ Potential for disturbance of up to 512 acres of existing degraded or former marsh that may provide low habitat value associated with converting it to fully functioning marsh that provides high value habitat</li> <li>▪ Potential for removal of some limited</li> </ul>	<p>AMM1 – To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats</p> <p>AMM2 – Avoid impacts of flow-related covered activities on covered species habitats at Topock Marsh</p> <p>AMM3 – To the extent practicable, avoid and minimize disturbance of covered bird species during the breeding season</p> <p>AMM5 – Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area</p> <p>AMM6 – Avoid or minimize impacts on covered species habitats during dredging, bank stabilization activities and other river management activities</p> <p>MRM1 – Conduct surveys and research to better identify covered and evaluation species habitat requirements</p> <p>MRM2 – Monitor and adaptively manage created covered and evaluation species habitats</p> <p>MRM5 – Monitor selenium levels in created backwater and marsh land cover types, and study the effect of selenium released as a result of dredging activities</p> <p>CLRA1 – Create 512 acres of Yuma clapper rail habitat</p> <p>CMM1 – Reduce risk of loss of created habitat to wildfire</p> <p>CMM2 – Replace created habitat affected by wildfire</p>	<p>Implementation of the conservation measures achieves the LCR MSCP goals to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the Yuma clapper rail, and to contribute to its recovery.</p> <p>Implementation of these measures would contribute to recovery by increasing the amount of new nesting habitat by 269 acres over the number of impacted acres.</p>

**Table 2.1-3. Summary of Impacts on Covered and Evaluation Species and Estimated Level of Take Associated with Implementation of Flow- and Non-Flow-Related Covered Activities and the Conservation Plan**

<i>Species</i>	<i>Impacts and Estimated Level of Take</i>	<i>Conservation Measures to Avoid, Minimize, and Mitigate Impacts</i>	<i>Summary of Expected Outcomes</i>
	<p>and low value habitat (e.g., dry patches of herbaceous vegetation near marsh edges) as a result of creating covered species habitats with implementation of the LCR MSCP Conservation Plan<sup>b</sup></p> <ul style="list-style-type: none"> <li>▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan</li> <li>▪ Potential for direct mortality of a small number of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP</li> </ul>	CLRA2 – Maintain existing important Yuma clapper rail habitat areas	
South-western willow flycatcher	<ul style="list-style-type: none"> <li>▪ Loss of up to 1,784 acres of habitat associated with implementation of flow-related covered activities</li> <li>▪ Periodic establishment and loss of habitat within the full pool elevation of Lake Mead as a result of fluctuations in reservoir elevation</li> <li>▪ Loss of up to 59 acres of habitat associated with implementation of Federal non-flow-related covered activities<sup>a</sup></li> <li>▪ Potential for loss of up to 10 acres of degraded, low-value habitat associated with non-Federal, non-flow-related,</li> </ul>	<p>AMM1 – To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats</p> <p>AMM2 – Avoid impacts of flow-related covered activities on covered species habitats at Topock Marsh</p> <p>AMM3 – To the extent practicable, avoid and minimize disturbance of covered bird species during the breeding season</p> <p>AMM5 – Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area</p> <p>AMM6 – Avoid or minimize impacts on covered species habitats during dredging, bank stabilization activities and other river management activities</p>	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the southwestern willow flycatcher, and contribute to its recovery. Implementation of these measures would

**Table 2.1-3. Summary of Impacts on Covered and Evaluation Species and Estimated Level of Take Associated with Implementation of Flow- and Non-Flow-Related Covered Activities and the Conservation Plan**

<i>Species</i>	<i>Impacts and Estimated Level of Take</i>	<i>Conservation Measures to Avoid, Minimize, and Mitigate Impacts</i>	<i>Summary of Expected Outcomes</i>
	<p>habitat restoration and habitat management activities</p> <ul style="list-style-type: none"> <li>Potential for incidental take of individuals from activities that create covered species habitats in land cover types not considered to be habitat for the species, but where some transitory or minor use of the land cover type does occur<sup>b</sup></li> <li>Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan</li> </ul>	<p>MRM1 – Conduct surveys and research to better identify covered and evaluation species habitat requirements</p> <p>MRM2 – Monitor and adaptively manage created covered and evaluation species habitats</p> <p>MRM4 – Conduct research to determine and address the effects of brown-headed cowbird nest parasitism on reproduction of covered species</p> <p>WIFL1 – Create 4,050 acres of Southwestern willow flycatcher habitat</p> <p>CMM1 – Reduce risk of loss of created habitat to wildfire</p> <p>CMM2 – Replace created habitat affected by wildfire</p> <p>WIFL2 – Maintain existing important habitat areas</p>	<p>contribute to recovery by increasing the amount of new breeding habitat by 2,197 acres in addition to replacing the extent of impacted habitat. The conservation measures would also contribute to the objectives of the Southwestern Willow Flycatcher Recovery Plan (USFWS 2002b).</p>
Desert tortoise (Mojave population)	<ul style="list-style-type: none"> <li>Loss of up to 192 acres of habitat associated with implementation of Federal non-flow-related covered activities<sup>a</sup></li> <li>Potential for direct mortality of individuals associated with operation of vehicles and other equipment with implementation of non-flow-related covered activities and implementation of the LCR MSCP Conservation Plan over the term of the LCR MSCP</li> </ul>	<p>AMM5 – Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area</p> <p>DETO1 – Acquire and protect 230 acres of existing unprotected occupied habitat</p> <p>DETO2 – Avoid impacts on individuals and their burrows</p>	<p>Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the Mohave population of desert tortoises.</p>
Bonytail	<ul style="list-style-type: none"> <li>Loss of up to 399 acres of habitat associated with implementation of flow-related covered activities</li> </ul>	<p>AMM1 – To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats</p>	<p>Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize,</p>

**Table 2.1-3. Summary of Impacts on Covered and Evaluation Species and Estimated Level of Take Associated with Implementation of Flow- and Non-Flow-Related Covered Activities and the Conservation Plan**

<i>Species</i>	<i>Impacts and Estimated Level of Take</i>	<i>Conservation Measures to Avoid, Minimize, and Mitigate Impacts</i>	<i>Summary of Expected Outcomes</i>
	<ul style="list-style-type: none"> <li>▪ Potential temporary disturbance of habitat associated with the creation of habitat and habitat management activities.</li> <li>▪ Potential for entrainment of individuals at diversions over the term of the LCR MSCP</li> <li>▪ Potential for direct mortality of individuals as a result of stranding over the term of the LCR MSCP</li> </ul>	<p>AMM4 – Minimize contaminant loads in runoff and return irrigation flows from LCR MSCP created habitats to the LCR</p> <p>AMM5 – Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area</p> <p>AMM6 – Avoid or minimize impacts on covered species habitats during dredging, bank stabilization activities and other river management activities</p> <p>MRM5 – Monitor selenium levels in created backwater and marsh land cover types, and study the effect of selenium released as a result of dredging activities</p> <p>BONY1 – Coordinate bonytail conservation efforts with the Service and recovery programs for endangered fish species in the Lower Basin</p> <p>BONY2 – Create 360 acres of bonytail habitat</p> <p>BONY3 – Augment bonytail populations</p> <p>BONY4 – Evaluate and develop, if necessary, additional bonytail rearing capacity</p> <p>BONY5 – Conduct monitoring and research, and adaptively manage bonytail augmentations and created habitat</p>	<p>and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the bonytail, and contribute to its recovery. Implementation of these measures would contribute to attainment of the recovery goals established for the species (USFWS 2002c).</p>

**Table 2.1-3. Summary of Impacts on Covered and Evaluation Species and Estimated Level of Take Associated with Implementation of Flow- and Non-Flow-Related Covered Activities and the Conservation Plan**

<i>Species</i>	<i>Impacts and Estimated Level of Take</i>	<i>Conservation Measures to Avoid, Minimize, and Mitigate Impacts</i>	<i>Summary of Expected Outcomes</i>
Humpback chub	<ul style="list-style-type: none"> <li>Periodic loss of up to 62 miles of transitory Colorado River channel habitat that may be present in Lake Mead when the reservoir is below full pool elevation and lost when reservoir elevations are raised</li> </ul>	HUCH1 – Provide funding to support existing humpback chub conservation programs	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the humpback chub, and contribute to its recovery.
Razorback sucker	<ul style="list-style-type: none"> <li>Loss of up to 399 acres of habitat associated with implementation of flow-related covered activities</li> <li>Potential for periodic loss of razorback sucker spawning habitat in Lake Mead (Reach 1) with implementation of flow-related covered activities</li> <li>Potential temporary disturbance of habitat associated with the creation of habitat and habitat management activities.</li> <li>Potential for entrainment of individuals at diversions over the term of the LCR MSCP</li> <li>Potential for direct mortality of individuals as a result of stranding over the term of the LCR MSCP</li> </ul>	<p>AMM1 – To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats</p> <p>AMM4 – Minimize contaminant loads in runoff and return irrigation flows from LCR MSCP created habitats to the LCR</p> <p>AMM5 – Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area</p> <p>AMM6 – Avoid or minimize impacts on covered species habitats during dredging, bank stabilization activities and other river management activities</p> <p>MRM5 – Monitor selenium levels in created backwater and marsh land cover types, and study the effect of selenium released as a result of dredging activities</p> <p>RASU1 – Coordinate razorback sucker conservation efforts with the Service and recovery programs for endangered fish species in the Lower Basin</p>	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the razorback sucker, and contribute to its recovery. Implementation of these measures would contribute to attainment of the recovery goals established for the species (USFWS 2002e).

**Table 2.1-3. Summary of Impacts on Covered and Evaluation Species and Estimated Level of Take Associated with Implementation of Flow- and Non-Flow-Related Covered Activities and the Conservation Plan**

<i>Species</i>	<i>Impacts and Estimated Level of Take</i>	<i>Conservation Measures to Avoid, Minimize, and Mitigate Impacts</i>	<i>Summary of Expected Outcomes</i>
		<p>RASU2 – Create 360 acres of razorback sucker habitat</p> <p>RASU3 – Augment razorback populations</p> <p>RASU4 – Develop additional razorback sucker rearing capacity</p> <p>RASU5 – Support ongoing razorback conservation efforts at Lake Mohave</p> <p>RASU6 – Conduct monitoring and research, and adaptively manage razorback sucker augmentations and created habitat</p> <p>RASU7 – Provide funding and support for continuation of the Reclamation/SNWA ongoing Lake Mead razorback sucker studies</p> <p>RASU8 – Continue razorback conservation measures identified in the ISC/SIA BO</p>	
<b>OTHER COVERED SPECIES</b>			
Western red bat (roosting habitat)	<ul style="list-style-type: none"> <li>▪ Loss of up to 161 acres of habitat associated with implementation of flow-related covered activities</li> <li>▪ Periodic establishment and loss of habitat within the full pool elevation of Lake Mead as a result of fluctuations in reservoir elevation</li> <li>▪ Loss of up to 604 acres of habitat associated with implementation of Federal non-flow-related covered activities<sup>a</sup></li> <li>▪ Potential for incidental take of</li> </ul>	<p>AMM1 – To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats</p> <p>AMM5 – Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area</p> <p>AMM6 – Avoid or minimize impacts on covered species habitats during dredging, bank stabilization activities and other river management activities</p> <p>MRM1 – Conduct surveys and research to better identify covered and evaluation species habitat requirements</p>	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the western red bat.

**Table 2.1-3. Summary of Impacts on Covered and Evaluation Species and Estimated Level of Take Associated with Implementation of Flow- and Non-Flow-Related Covered Activities and the Conservation Plan**

<i>Species</i>	<i>Impacts and Estimated Level of Take</i>	<i>Conservation Measures to Avoid, Minimize, and Mitigate Impacts</i>	<i>Summary of Expected Outcomes</i>
	<p>individuals from activities that create covered species habitats in land cover types not considered to be habitat for the species, but where some transitory or minor use of the land cover type does occur<sup>b</sup></p> <ul style="list-style-type: none"> <li>Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan</li> <li>Potential for likely small, unmeasurable, effects on the production and abundance of insect prey associated with implementation of covered activities</li> </ul>	<p>MRM2 – Monitor and adaptively manage created covered and evaluation species habitats</p> <p>WRBA1 – Conduct surveys to determine species distribution of the western red bat</p> <p>WRBA2 – Create 765 acres of western red bat roosting habitat</p> <p>CMM1 – Reduce risk of loss of created habitat to wildfire</p> <p>CMM2 – Replace created habitat affected by wildfire</p>	
Western yellow bat (roosting habitat)	<ul style="list-style-type: none"> <li>Loss of up to 161 acres of habitat associated with implementation of flow-related covered activities</li> <li>Periodic establishment and loss of habitat within the full pool elevation of Lake Mead as a result of fluctuations in reservoir elevation</li> <li>Loss of up to 604 acres of habitat associated with implementation of Federal non-flow-related covered activities<sup>a</sup></li> <li>Potential for incidental take of individuals from activities that create</li> </ul>	<p>AMM1 – To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats</p> <p>AMM5 – Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area</p> <p>AMM6 – Avoid or minimize impacts on covered species habitats during dredging, bank stabilization activities and other river management activities</p> <p>MRM1 – Conduct surveys and research to better identify covered and evaluation species habitat requirements</p> <p>MRM2 – Monitor and adaptively manage created covered and evaluation species habitats</p>	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the western yellow bat.

**Table 2.1-3. Summary of Impacts on Covered and Evaluation Species and Estimated Level of Take Associated with Implementation of Flow- and Non-Flow-Related Covered Activities and the Conservation Plan**

<i>Species</i>	<i>Impacts and Estimated Level of Take</i>	<i>Conservation Measures to Avoid, Minimize, and Mitigate Impacts</i>	<i>Summary of Expected Outcomes</i>
	<p>covered species habitats in land cover types not considered to be habitat for the species, but where some transitory or minor use of the land cover type does occur<sup>b</sup></p> <ul style="list-style-type: none"> <li>Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan</li> <li>Potential for likely small, unmeasurable, effects on the production and abundance of insect prey associated with implementation of covered activities</li> </ul>	<p>WYBA1 – Conduct surveys to determine species distribution of the western yellow bat</p> <p>WYBA2 – Avoid removal of western yellow bat roosts trees</p> <p>WYBA3 – Create 765 acres of western yellow bat roosting habitat</p> <p>CMM1 – Reduce risk of loss of created habitat to wildfire</p> <p>CMM2 – Replace created habitat affected by wildfire</p>	
Desert pocket mouse	<ul style="list-style-type: none"> <li>Potential temporary or permanent disturbance or loss of habitat associated with the restoration of habitat and habitat management activities</li> <li>Potential temporary disturbance of habitat associated with the creation of LCR MSCP habitats and habitat management activities<sup>b</sup></li> <li>Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan</li> </ul>	<p>AMM5 – Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area</p> <p>DPMO1 – Conduct surveys to locate desert pocket mouse habitat</p>	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the desert pocket mouse.



**Table 2.1-3. Summary of Impacts on Covered and Evaluation Species and Estimated Level of Take Associated with Implementation of Flow- and Non-Flow-Related Covered Activities and the Conservation Plan**

<i>Species</i>	<i>Impacts and Estimated Level of Take</i>	<i>Conservation Measures to Avoid, Minimize, and Mitigate Impacts</i>	<i>Summary of Expected Outcomes</i>
	<ul style="list-style-type: none"> <li>Potential for direct mortality of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP</li> </ul>		
Colorado River cotton rat	<ul style="list-style-type: none"> <li>Loss of up to 59 acres of habitat associated with implementation of flow-related covered activities</li> <li>Loss of up to 3 acres of habitat associated with implementation of Federal non-flow-related covered activities<sup>a</sup></li> <li>Potential for loss of up to 5 acres of degraded, low-value habitat associated with non-Federal, non-flow-related, restoration of habitat and habitat management activities</li> <li>Potential for disturbance of up to 125 acres of existing degraded or former marsh that may provide low habitat value associated with converting it to fully functioning marsh that provides high value habitat</li> <li>Potential for removal of some limited and low value habitat (e.g., dry patches of herbaceous vegetation near marsh edges) as a result of creating covered species habitats with implementation of the LCR MSCP Conservation Plan<sup>b</sup></li> </ul>	<p>AMM1 – To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats</p> <p>AMM2 – Avoid impacts of flow-related covered activities on covered species habitats at Topock Marsh</p> <p>AMM5 – Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area</p> <p>AMM6 – Avoid or minimize impacts on covered species habitats during dredging, bank stabilization activities and other river management activities</p> <p>MRM2 – Monitor and adaptively manage created covered and evaluation species habitats</p> <p>MRM5 – Monitor selenium levels in created backwater and marsh land cover types, and study the effect of selenium released as a result of dredging activities</p> <p>CRCCR1 – Conduct research to better define Colorado River cotton rat habitat requirements</p> <p>CRCCR2 – Create 125 acres of Colorado River cotton rat habitat</p> <p>CMM1 – Reduce risk of loss of created habitat to wildfire</p>	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the Colorado River cotton rat.

**Table 2.1-3. Summary of Impacts on Covered and Evaluation Species and Estimated Level of Take Associated with Implementation of Flow- and Non-Flow-Related Covered Activities and the Conservation Plan**

<i>Species</i>	<i>Impacts and Estimated Level of Take</i>	<i>Conservation Measures to Avoid, Minimize, and Mitigate Impacts</i>	<i>Summary of Expected Outcomes</i>
	<ul style="list-style-type: none"> <li>Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan</li> <li>Potential for direct mortality of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP</li> </ul>	CMM2 – Replace created habitat affected by wildfire	
Yuma hispid cotton rat	<ul style="list-style-type: none"> <li>Loss of up to 71 acres of habitat associated with implementation of Federal non-flow-related covered activities<sup>a</sup></li> <li>Potential for loss of up to 5 acres of degraded, low-value habitat associated with non-Federal, non-flow-related, habitat restoration and habitat management activities</li> <li>Potential for incidental take of individuals from activities that create covered species habitats in land cover types not considered to be habitat for the species, but where some transitory or minor use of the land cover type does occur<sup>b</sup></li> <li>Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan</li> </ul>	<p>AMM1 – To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats</p> <p>AMM5 – Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area</p> <p>AMM6 – Avoid or minimize impacts on covered species habitats during dredging, bank stabilization activities and other river management activities</p> <p>MRM2 – Monitor and adaptively manage created covered and evaluation species habitats</p> <p>YHCR1 – Conduct research to better define Yuma hispid cotton rat habitat requirements</p> <p>YHCR2 – Create 76 acres of Yuma hispid cotton rat habitat</p> <p>CMM1 – Reduce risk of loss of created habitat to wildfire</p> <p>CMM2 – Replace created habitat affected by wildfire</p>	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the Yuma hispid cotton rat.

**Table 2.1-3. Summary of Impacts on Covered and Evaluation Species and Estimated Level of Take Associated with Implementation of Flow- and Non-Flow-Related Covered Activities and the Conservation Plan**

<i>Species</i>	<i>Impacts and Estimated Level of Take</i>	<i>Conservation Measures to Avoid, Minimize, and Mitigate Impacts</i>	<i>Summary of Expected Outcomes</i>
	<ul style="list-style-type: none"> <li>Potential for direct mortality of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP</li> </ul>		
Western least bittern	<ul style="list-style-type: none"> <li>Loss of up to 133 acres of habitat associated with implementation of flow-related covered activities</li> <li>Periodic establishment and loss of habitat within the full pool elevation of Lake Mead as a result of fluctuations in reservoir elevation</li> <li>Loss of up to 70 acres of habitat associated with implementation of Federal non-flow-related covered activities<sup>a</sup></li> <li>Potential for loss of up to 10 acres of degraded, low-value habitat associated with non-Federal, non-flow-related, habitat restoration and habitat management activities</li> <li>Potential periodic removal of up to 30 acres of emergent vegetation that could provide habitat along 244 miles of drains</li> <li>Potential for disturbance of up to 512 acres of existing degraded or former marsh that may provide low habitat</li> </ul>	<p>AMM1 – To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats</p> <p>AMM2 – Avoid impacts of flow-related covered activities on covered species habitats at Topock Marsh</p> <p>AMM3 – To the extent practicable, avoid and minimize disturbance of covered bird species during the breeding season</p> <p>AMM5 – Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area</p> <p>AMM6 – Avoid or minimize impacts on covered species habitats during dredging, bank stabilization activities and other river management activities</p> <p>MRM1 – Conduct surveys and research to better identify covered and evaluation species habitat requirements</p> <p>MRM2 – Monitor and adaptively manage created covered and evaluation species habitats</p> <p>MRM5 – Monitor selenium levels in created backwater and marsh land cover types, and study the effect of selenium released as a result of dredging activities</p>	<p>Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the western least bittern, and reduce the likelihood of future Federal listing of the species. Implementation of these measures would benefit the western least bittern by increasing the amount of new habitat in the LCR MSCP planning area by 269 acres in addition to replacing the extent of impacted habitat.</p>

**Table 2.1-3. Summary of Impacts on Covered and Evaluation Species and Estimated Level of Take Associated with Implementation of Flow- and Non-Flow-Related Covered Activities and the Conservation Plan**

<i>Species</i>	<i>Impacts and Estimated Level of Take</i>	<i>Conservation Measures to Avoid, Minimize, and Mitigate Impacts</i>	<i>Summary of Expected Outcomes</i>
	<p>value associated with converting it to fully functioning marsh that provides high value habitat</p> <ul style="list-style-type: none"> <li>▪ Potential for removal of some limited and low value habitat (e.g., dry patches of herbaceous vegetation near marsh edges) as a result of creating covered species habitats with implementation of the LCR MSCP Conservation Plan<sup>b</sup></li> <li>▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan</li> <li>▪ Potential for direct mortality of a small number of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP</li> </ul>	<p>LEBI1 – Create 512 acres of western least bittern habitat</p> <p>CMM1 – Reduce risk of loss of created habitat to wildfire</p> <p>CMM2 – Replace created habitat affected by wildfire</p>	
California black rail	<ul style="list-style-type: none"> <li>▪ Loss of up to 37 acres of habitat associated with implementation of flow-related covered activities</li> <li>▪ Loss of up to 31 acres of habitat associated with implementation of Federal non-flow-related covered activities<sup>a</sup></li> <li>▪ Potential for loss of up to 5 acres of degraded, low-value habitat associated with non-Federal, non-flow-related,</li> </ul>	<p>AMM1 – To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats</p> <p>AMM2 – Avoid impacts of flow-related covered activities on covered species habitats at Topock Marsh</p> <p>AMM3 – To the extent practicable, avoid and minimize disturbance of covered bird species during the breeding season</p> <p>AMM5 – Avoid impacts of operation, maintenance, and</p>	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the California black rail, and reduce the likelihood of

**Table 2.1-3. Summary of Impacts on Covered and Evaluation Species and Estimated Level of Take Associated with Implementation of Flow- and Non-Flow-Related Covered Activities and the Conservation Plan**

<i>Species</i>	<i>Impacts and Estimated Level of Take</i>	<i>Conservation Measures to Avoid, Minimize, and Mitigate Impacts</i>	<i>Summary of Expected Outcomes</i>
	<p>habitat restoration and habitat management activities</p> <ul style="list-style-type: none"> <li>▪ Potential periodic removal of up to 30 acres of emergent vegetation that could provide habitat along 244 miles of drains</li> <li>▪ Potential for disturbance of up to 130 acres of existing degraded or former marsh that may provide low habitat value associated with converting it to fully functioning marsh that provides high value habitat</li> <li>▪ Potential for removal of some limited and low value habitat (e.g., dry patches of herbaceous vegetation near marsh edges) as a result of creating covered species habitats with implementation of the LCR MSCP Conservation Plan<sup>b</sup></li> <li>▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan</li> <li>▪ Potential for direct mortality of a small number of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP</li> </ul>	<p>replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area</p> <p>AMM6 – Avoid or minimize impacts on covered species habitats during dredging, bank stabilization activities and other river management activities</p> <p>MRM1 – Conduct surveys and research to better identify covered and evaluation species habitat requirements</p> <p>MRM2 – Monitor and adaptively manage created covered and evaluation species habitats</p> <p>MRM5 – Monitor selenium levels in created backwater and marsh land cover types, and study the effect of selenium released as a result of dredging activities</p> <p>BLRA1 – Create 130 acres of California black rail habitat</p> <p>CMM1 – Reduce risk of loss of created habitat to wildfire</p> <p>CMM2 – Replace created habitat affected by wildfire</p> <p>BLRA2 – Maintain existing important California black rail habitat areas</p>	<p>future Federal listing of the species.</p> <p>Implementation of these measures would benefit the California black rail by increasing the amount of new habitat in the LCR MSCP planning area by 27 acres in addition to replacing the extent of impacted habitat.</p>

**Table 2.1-3. Summary of Impacts on Covered and Evaluation Species and Estimated Level of Take Associated with Implementation of Flow- and Non-Flow-Related Covered Activities and the Conservation Plan**

<i>Species</i>	<i>Impacts and Estimated Level of Take</i>	<i>Conservation Measures to Avoid, Minimize, and Mitigate Impacts</i>	<i>Summary of Expected Outcomes</i>
Yellow-billed cuckoo	<ul style="list-style-type: none"> <li>▪ Loss of up to 1,425 acres of habitat associated with implementation of flow-related covered activities</li> <li>▪ Periodic establishment and loss of habitat within the full pool elevation of Lake Mead as a result of fluctuations in reservoir elevation</li> <li>▪ Loss of up to 99 acres of habitat associated with implementation of Federal non-flow-related covered activities<sup>a</sup></li> <li>▪ Potential for loss of up to 10 acres of degraded, low-value habitat associated with non-Federal, non-flow-related, habitat restoration and habitat management activities</li> <li>▪ Potential for incidental take of individuals from activities that create covered species habitats in land cover types not considered to be habitat for the species, but where some transitory or minor use of the land cover type does occur<sup>b</sup></li> <li>▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan</li> <li>▪ Potential for mortality of a small number of individuals associated with non-flow-related covered activities over the term of the LCR MSCP</li> </ul>	<p>AMM1 – To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats</p> <p>AMM2 – Avoid impacts of flow-related covered activities on covered species habitats at Topock Marsh</p> <p>AMM3 – To the extent practicable, avoid and minimize disturbance of covered bird species during the breeding season</p> <p>AMM5 – Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area</p> <p>AMM6 – Avoid or minimize impacts on covered species habitats during dredging, bank stabilization activities and other river management activities</p> <p>MRM1 – Conduct surveys and research to better identify covered and evaluation species habitat requirements</p> <p>MRM2 – Monitor and adaptively manage created covered and evaluation species habitats</p> <p>YBCU1 – Create 4,050 acres of yellow-billed cuckoo habitat</p> <p>CMM1 – Reduce risk of loss of created habitat to wildfire</p> <p>CMM2 – Replace created habitat affected by wildfire</p> <p>YBCU2 – Maintain existing important yellow-billed cuckoo habitat areas</p>	<p>Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the yellow-billed cuckoo, and reduce the likelihood of future Federal listing of the species. Implementation of these measures would benefit the yellow-billed cuckoo by increasing the amount of new habitat in the LCR MSCP planning area by 2,516 acres in addition to replacing the extent of impacted habitat.</p>

**Table 2.1-3. Summary of Impacts on Covered and Evaluation Species and Estimated Level of Take Associated with Implementation of Flow- and Non-Flow-Related Covered Activities and the Conservation Plan**

<i>Species</i>	<i>Impacts and Estimated Level of Take</i>	<i>Conservation Measures to Avoid, Minimize, and Mitigate Impacts</i>	<i>Summary of Expected Outcomes</i>
	<ul style="list-style-type: none"> <li>▪ Loss of up to 161 acres of habitat associated with implementation of flow-related covered activities</li> <li>▪ Loss of up to 590 acres of habitat associated with implementation of Federal non-flow-related covered activities<sup>a</sup></li> <li>▪ Potential for incidental take of individuals from activities that create covered species habitats in land cover types not considered to be habitat for the species, but where some transitory or minor use of the land cover type does occur<sup>b</sup></li> <li>▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan</li> <li>▪ Potential for direct mortality of a small number of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP</li> </ul>		
Elf owl	<ul style="list-style-type: none"> <li>▪ Loss of up to 1,425 acres of habitat associated with implementation of flow-related covered activities</li> <li>▪ Loss of up to 99 acres of habitat</li> </ul>	<p>AMM1 – To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats</p> <p>AMM3 – To the extent practicable, avoid and minimize</p>	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate

**Table 2.1-3. Summary of Impacts on Covered and Evaluation Species and Estimated Level of Take Associated with Implementation of Flow- and Non-Flow-Related Covered Activities and the Conservation Plan**

<i>Species</i>	<i>Impacts and Estimated Level of Take</i>	<i>Conservation Measures to Avoid, Minimize, and Mitigate Impacts</i>	<i>Summary of Expected Outcomes</i>
	<p>associated with implementation of Federal non-flow-related covered activities<sup>a</sup></p> <ul style="list-style-type: none"> <li>▪ Potential for loss of up to 10 acres of degraded, low-value habitat associated with non-Federal, non-flow-related, habitat restoration and habitat management activities</li> <li>▪ Potential for incidental take of individuals from activities that create covered species habitats in land cover types not considered to be habitat for the species, but where some transitory or minor use of the land cover type does occur<sup>b</sup></li> <li>▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan</li> <li>▪ Potential for direct mortality of a small number of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP</li> </ul>	<p>disturbance of covered bird species during the breeding season</p> <p>AMM5 – Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area</p> <p>AMM6 – Avoid or minimize impacts on covered species habitats during dredging, bank stabilization activities and other river management activities</p> <p>MRM1 – Conduct surveys and research to better identify covered and evaluation species habitat requirements</p> <p>MRM2 – Monitor and adaptively manage created covered and evaluation species habitats</p> <p>MRM3 – Conduct research to determine and address the effects of nest site competition with European starlings on reproduction of covered species</p> <p>ELOW1 – Create 1,784 acres of elf owl habitat</p> <p>ELOW2 – Install elf owl nest boxes</p> <p>CMM1 – Reduce risk of loss of created habitat to wildfire</p> <p>CMM2 – Replace created habitat affected by wildfire</p>	<p>adverse effects of covered activities and LCR MSCP implementation on the elf owl, and reduce the likelihood of future Federal listing of the species. Implementation of these measures would benefit the elf owl by increasing the amount of new habitat in the LCR MSCP planning area by 1,033 acres in addition to replacing the extent of impacted habitat.</p>



**Table 2.1-3. Summary of Impacts on Covered and Evaluation Species and Estimated Level of Take Associated with Implementation of Flow- and Non-Flow-Related Covered Activities and the Conservation Plan**

<i>Species</i>	<i>Impacts and Estimated Level of Take</i>	<i>Conservation Measures to Avoid, Minimize, and Mitigate Impacts</i>	<i>Summary of Expected Outcomes</i>
Gilded flicker	<ul style="list-style-type: none"> <li>Loss of up to 819 acres of habitat associated with implementation of flow-related covered activities</li> <li>Loss of up to 26 acres of habitat associated with implementation of Federal non-flow-related covered activities<sup>a</sup></li> <li>Potential for loss of up to 10 acres of degraded, low-value habitat associated with non-Federal, non-flow-related, habitat restoration and habitat management activities</li> <li>Potential for incidental take of individuals from activities that create covered species habitats in land cover types not considered to be habitat for the species, but where some transitory or minor use of the land cover type does occur<sup>b</sup></li> <li>Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan</li> <li>Potential for direct mortality of a small number of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP</li> </ul>	<p>AMM1 – To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats</p> <p>AMM2 – Avoid impacts of flow-related covered activities on covered species habitats at Topock Marsh</p> <p>AMM3 – To the extent practicable, avoid and minimize disturbance of covered bird species during the breeding season</p> <p>AMM5 – Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area</p> <p>AMM6 – Avoid or minimize impacts on covered species habitats during dredging, bank stabilization activities and other river management activities</p> <p>MRM1 – Conduct surveys and research to better identify covered and evaluation species habitat requirements</p> <p>MRM2 – Monitor and adaptively manage created covered and evaluation species habitats</p> <p>MRM3 – Conduct research to determine and address the effects of nest site competition with European starlings on reproduction of covered species</p> <p>GIFL1 – Create 4,050 acres of gilded flicker habitat</p> <p>GIFL2 – Install artificial snags to provide gilded flicker nest sites</p> <p>CMM1 – Reduce risk of loss of created habitat to wildfire</p> <p>CMM2 – Replace created habitat affected by wildfire</p>	<p>Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the gilded flicker, and reduce the likelihood of future Federal listing of the species.</p> <p>Implementation of these measures would benefit the gilded flicker by increasing the amount of new habitat in the LCR MSCP planning area by 2,516 acres in addition to replacing the extent of impacted habitat.</p>

**Table 2.1-3. Summary of Impacts on Covered and Evaluation Species and Estimated Level of Take Associated with Implementation of Flow- and Non-Flow-Related Covered Activities and the Conservation Plan**

<i>Species</i>	<i>Impacts and Estimated Level of Take</i>	<i>Conservation Measures to Avoid, Minimize, and Mitigate Impacts</i>	<i>Summary of Expected Outcomes</i>
Gila woodpecker	<ul style="list-style-type: none"> <li>▪ Loss of up to 1,890 acres of habitat associated with implementation of flow-related covered activities</li> <li>▪ Periodic establishment and loss of habitat within the full pool elevation of Lake Mead as a result of fluctuations in reservoir elevation</li> <li>▪ Loss of up to 714 acres of habitat associated with implementation of Federal non-flow-related covered activities<sup>a</sup></li> <li>▪ Potential for loss of up to 10 acres of degraded, low-value habitat associated with non-Federal, non-flow-related, habitat restoration and habitat management activities</li> <li>▪ Potential for incidental take of individuals from activities that create covered species habitats in land cover types not considered to be habitat for the species, but where some transitory or minor use of the land cover type does occur<sup>b</sup></li> <li>▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan</li> </ul>	<p>AMM1 – To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats</p> <p>AMM3 – To the extent practicable, avoid and minimize disturbance of covered bird species during the breeding season</p> <p>AMM5 – Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area</p> <p>AMM6 – Avoid or minimize impacts on covered species habitats during dredging, bank stabilization activities and other river management activities</p> <p>MRM1 – Conduct surveys and research to better identify covered and evaluation species habitat requirements</p> <p>MRM2 – Monitor and adaptively manage created covered and evaluation species habitats</p> <p>MRM3 – Conduct research to determine and address the effects of nest site competition with European starlings on reproduction of covered species</p> <p>GIWO1 – Create 1,702 acres of Gila woodpecker habitat</p> <p>GIWO2 – Install artificial snags to provide Gila woodpecker nest sites</p> <p>CMM1 – Reduce risk of loss of created habitat to wildfire</p> <p>CMM2 – Replace created habitat affected by wildfire</p>	<p>Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the Gila woodpecker, and reduce the likelihood of future Federal listing of the species.</p> <p>Implementation of these measures would benefit the gilded flicker by increasing the amount of new habitat in the LCR MSCP planning area by 847 acres in addition to replacing the extent of impacted habitat.</p>

**Table 2.1-3. Summary of Impacts on Covered and Evaluation Species and Estimated Level of Take Associated with Implementation of Flow- and Non-Flow-Related Covered Activities and the Conservation Plan**

<i>Species</i>	<i>Impacts and Estimated Level of Take</i>	<i>Conservation Measures to Avoid, Minimize, and Mitigate Impacts</i>	<i>Summary of Expected Outcomes</i>
	<ul style="list-style-type: none"> <li>Potential for direct mortality of a small number of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP</li> </ul>		
Vermilion flycatcher	<ul style="list-style-type: none"> <li>Loss of up to 1,654 acres of habitat associated with implementation of flow-related covered activities</li> <li>Periodic establishment and loss of habitat within the full pool elevation of Lake Mead as a result of fluctuations in reservoir elevation</li> <li>Loss of up to 1,309 acres of habitat associated with implementation of Federal non-flow-related covered activities<sup>a,c</sup></li> <li>Potential for loss of up to 20 acres of degraded, low-value habitat associated with non-Federal, non-flow-related, habitat restoration and habitat management activities</li> <li>Potential for incidental take of individuals from activities that create covered species habitats in land cover types not considered to be habitat for the species, but where some transitory or minor use of the land cover type does occur<sup>b</sup></li> </ul>	<p>AMM1 – To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats</p> <p>AMM2 – Avoid impacts of flow-related covered activities on covered species habitats at Topock Marsh</p> <p>AMM3 – To the extent practicable, avoid and minimize disturbance of covered bird species during the breeding season</p> <p>AMM5 – Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area</p> <p>AMM6 – Avoid or minimize impacts on covered species habitats during dredging, bank stabilization activities and other river management activities</p> <p>MRM1 – Conduct surveys and research to better identify covered and evaluation species habitat requirements</p> <p>MRM2 – Monitor and adaptively manage created covered and evaluation species habitats</p> <p>MRM4 – Conduct research to determine and address the effects of brown-headed cowbird nest parasitism on reproduction of covered species</p> <p>VEFL1 – Create 5,208 acres of vermilion flycatcher habitat</p>	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the vermilion flycatcher, and reduce the likelihood of future Federal listing of the species. Implementation of these measures would benefit the vermilion flycatcher by increasing the amount of new habitat in the LCR MSCP planning area by 2,594 acres in addition to replacing the extent of impacted habitat.

**Table 2.1-3. Summary of Impacts on Covered and Evaluation Species and Estimated Level of Take Associated with Implementation of Flow- and Non-Flow-Related Covered Activities and the Conservation Plan**

<i>Species</i>	<i>Impacts and Estimated Level of Take</i>	<i>Conservation Measures to Avoid, Minimize, and Mitigate Impacts</i>	<i>Summary of Expected Outcomes</i>
	<ul style="list-style-type: none"> <li>Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan</li> <li>Potential for direct mortality of a small number of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP</li> </ul>	<p>CMM1 – Reduce risk of loss of created habitat to wildfire</p> <p>CMM2 – Replace created habitat affected by wildfire</p>	
Arizona Bell's vireo	<ul style="list-style-type: none"> <li>Loss of up to 2,929 acres of habitat associated with implementation of flow-related covered activities</li> <li>Periodic establishment and loss of habitat within the full pool elevation of Lake Mead as a result of fluctuations in reservoir elevation</li> <li>Loss of up to 183 acres of habitat associated with implementation of Federal non-flow-related covered activities<sup>a</sup></li> <li>Potential for loss of up to 10 acres of degraded, low-value habitat associated with non-Federal, non-flow-related, habitat restoration and habitat management activities</li> <li>Potential for incidental take of individuals from activities that create</li> </ul>	<p>AMM1 – To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats</p> <p>AMM2 – Avoid impacts of flow-related covered activities on covered species habitats at Topock Marsh</p> <p>AMM3 – To the extent practicable, avoid and minimize disturbance of covered bird species during the breeding season</p> <p>AMM5 – Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area</p> <p>AMM6 – Avoid or minimize impacts on covered species habitats during dredging, bank stabilization activities and other river management activities</p> <p>MRM1 – Conduct surveys and research to better identify covered and evaluation species habitat requirements</p>	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the Arizona Bell's vireo.

**Table 2.1-3. Summary of Impacts on Covered and Evaluation Species and Estimated Level of Take Associated with Implementation of Flow- and Non-Flow-Related Covered Activities and the Conservation Plan**

<i>Species</i>	<i>Impacts and Estimated Level of Take</i>	<i>Conservation Measures to Avoid, Minimize, and Mitigate Impacts</i>	<i>Summary of Expected Outcomes</i>
	<p>covered species habitats in land cover types not considered to be habitat for the species, but where some transitory or minor use of the land cover type does occur<sup>b</sup></p> <ul style="list-style-type: none"> <li>▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan</li> <li>▪ Potential for direct mortality of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP</li> </ul>	<p>MRM2 – Monitor and adaptively manage created covered and evaluation species habitats</p> <p>MRM4 – Conduct research to determine and address the effects of brown-headed cowbird nest parasitism on reproduction of covered species</p> <p>BEVI1 – Create 2,983 acres of Arizona Bell’s vireo habitat</p> <p>CMM1 – Reduce risk of loss of created habitat to wildfire</p> <p>CMM2 – Replace created habitat affected by wildfire</p>	

**Table 2.1-3. Summary of Impacts on Covered and Evaluation Species and Estimated Level of Take Associated with Implementation of Flow- and Non-Flow-Related Covered Activities and the Conservation Plan**

<i>Species</i>	<i>Impacts and Estimated Level of Take</i>	<i>Conservation Measures to Avoid, Minimize, and Mitigate Impacts</i>	<i>Summary of Expected Outcomes</i>
Sonoran yellow warbler	<ul style="list-style-type: none"> <li>▪ Loss of up to 161 acres of habitat associated with implementation of flow-related covered activities</li> <li>▪ Periodic establishment and loss of habitat within the full pool elevation of Lake Mead as a result of fluctuations in reservoir elevation</li> <li>▪ Loss of up to 14 acres of habitat associated with implementation of Federal non-flow-related covered activities<sup>a</sup></li> <li>▪ Potential for incidental take of individuals from activities that create covered species habitats in land cover types not considered to be habitat for the species, but where some transitory or minor use of the land cover type does occur<sup>b</sup></li> <li>▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan</li> <li>▪ Potential for direct mortality of a small number of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP</li> </ul>	<p>AMM1 – To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats</p> <p>AMM2 – Avoid impacts of flow-related covered activities on covered species habitats at Topock Marsh</p> <p>AMM3 – To the extent practicable, avoid and minimize disturbance of covered bird species during the breeding season</p> <p>AMM5 – Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area</p> <p>AMM6 – Avoid or minimize impacts on covered species habitats during dredging, bank stabilization activities and other river management activities</p> <p>MRM1 – Conduct surveys and research to better identify covered and evaluation species habitat requirements</p> <p>MRM2 – Monitor and adaptively manage created covered and evaluation species habitats</p> <p>MRM4 – Conduct research to determine and address the effects of brown-headed cowbird nest parasitism on reproduction of covered species</p> <p>YWAR1 – Create 4,050 acres of Sonoran yellow warbler habitat</p> <p>CMM1 – Reduce risk of loss of created habitat to wildfire</p> <p>CMM2 – Replace created habitat affected by wildfire</p>	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the Sonoran yellow warbler, and reduce the likelihood of future Federal listing of the species. Implementation of these measures would benefit the Sonoran yellow warbler by increasing the amount of new habitat in the LCR MSCP planning area by 928 acres in addition to replacing the extent of impacted habitat.

**Table 2.1-3. Summary of Impacts on Covered and Evaluation Species and Estimated Level of Take Associated with Implementation of Flow- and Non-Flow-Related Covered Activities and the Conservation Plan**

<i>Species</i>	<i>Impacts and Estimated Level of Take</i>	<i>Conservation Measures to Avoid, Minimize, and Mitigate Impacts</i>	<i>Summary of Expected Outcomes</i>
Summer tanager	<ul style="list-style-type: none"> <li>Loss of up to 128 acres of habitat associated with implementation of Federal non-flow-related covered activities<sup>a</sup></li> <li>Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan</li> <li>Potential for direct mortality of individuals associated with implementation of non-flow-related covered activities and the LCR MSCP over the term of the LCR MSCP</li> </ul>	<p>AMM1 – To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats</p> <p>AMM3 – To the extent practicable, avoid and minimize disturbance of covered bird species during the breeding season</p> <p>AMM5 – Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area</p> <p>AMM6 – Avoid or minimize impacts on covered species habitats during dredging, bank stabilization activities and other river management activities</p> <p>MRM1 – Conduct surveys and research to better identify covered and evaluation species habitat requirements</p> <p>MRM2 – Monitor and adaptively manage created covered and evaluation species habitats</p> <p>MRM4 – Conduct research to determine and address the effects of brown-headed cowbird nest parasitism on reproduction of covered species</p> <p>SUTA1 – Create 602 acres of summer tanager habitat</p> <p>CMM1 – Reduce risk of loss of created habitat to wildfire</p> <p>CMM2 – Replace created habitat affected by wildfire</p>	<p>Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the summer tanager, and reduce the likelihood of future Federal listing of the species.</p> <p>Implementation of these measures would benefit the summer tanager by increasing the amount of new habitat in the LCR MSCP planning area by 427 acres in addition to replacing the extent of impacted habitat.</p>
Flat-tailed horned lizard	<ul style="list-style-type: none"> <li>Potential temporary disturbance of habitat associated with the creation of habitat and habitat management activities.</li> </ul>	<p>AMM5 – Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area</p> <p>FTHL1 – Acquire and protect 230 acres of existing</p>	<p>Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize,</p>

**Table 2.1-3. Summary of Impacts on Covered and Evaluation Species and Estimated Level of Take Associated with Implementation of Flow- and Non-Flow-Related Covered Activities and the Conservation Plan**

<i>Species</i>	<i>Impacts and Estimated Level of Take</i>	<i>Conservation Measures to Avoid, Minimize, and Mitigate Impacts</i>	<i>Summary of Expected Outcomes</i>
	<ul style="list-style-type: none"> <li>Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan</li> <li>Potential for direct mortality of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP</li> </ul>	<p>unprotected occupied flat-tailed horned lizard habitat</p> <p>FTHL2— Implement conservation measures to avoid or minimize take of flat-tailed horned lizard</p>	<p>and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the flat-tailed horned lizard.</p>
Relict leopard frog	<ul style="list-style-type: none"> <li>Loss of up to 85 acres of habitat associated with implementation of flow-related covered activities</li> <li>Periodic loss of transitory Colorado River and Virgin River channel habitat that may be present in Lake Mead when the reservoir is below full pool elevation and lost when reservoir elevations are raised</li> <li>Potential temporary disturbance of habitat associated with the creation of habitat and habitat management activities</li> <li>Potential for entrainment of individuals at diversions over the term of the LCR MSCP</li> <li>Harassment of individuals associated with operation of equipment and other</li> </ul>	<p>RLFR1— Provide funding to support existing relict leopard frog conservation programs</p>	<p>Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the relict leopard frog, and reduce the likelihood of future Federal listing of the species.</p>



**Table 2.1-3. Summary of Impacts on Covered and Evaluation Species and Estimated Level of Take Associated with Implementation of Flow- and Non-Flow-Related Covered Activities and the Conservation Plan**

<i>Species</i>	<i>Impacts and Estimated Level of Take</i>	<i>Conservation Measures to Avoid, Minimize, and Mitigate Impacts</i>	<i>Summary of Expected Outcomes</i>
	<p>activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan</p> <ul style="list-style-type: none"> <li>▪ Potential for direct mortality of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP</li> </ul>		
Flannel-mouth sucker	<ul style="list-style-type: none"> <li>▪ Loss of up to 172 acres of habitat associated with implementation of flow-related covered activities</li> <li>▪ Loss of up to 50 acres of habitat associated with implementation of Federal non-flow-related covered activities</li> <li>▪ Potential disturbance of or loss of a small, unquantifiable amount of habitat associated with the creation of habitat and habitat management activities</li> <li>▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan</li> <li>▪ Potential for direct mortality of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP</li> </ul>	<p>AMM1 – To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats</p> <p>AMM4 – Minimize contaminant loads in runoff and return irrigation flows from LCR MSCP created habitats to the LCR</p> <p>AMM5 – Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area</p> <p>AMM6 – Avoid or minimize impacts on covered species habitats during dredging, bank stabilization activities and other river management activities</p> <p>MRM2 – Monitor and adaptively manage created covered and evaluation species habitats</p> <p>MRM5 – Monitor selenium levels in created backwater and marsh land cover types, and study the effect of selenium released as a result of dredging activities</p> <p>FLSU1 – Create 85 acres of flannemouth sucker habitat</p> <p>FLSU2 – Provide funding to support existing flannemouth sucker conservation programs</p> <p>FLSU3 – Assess flannemouth sucker management needs and develop management strategies</p>	<p>Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the flannemouth sucker, and reduce the likelihood of future Federal listing of the species.</p>

**Table 2.1-3. Summary of Impacts on Covered and Evaluation Species and Estimated Level of Take Associated with Implementation of Flow- and Non-Flow-Related Covered Activities and the Conservation Plan**

<i>Species</i>	<i>Impacts and Estimated Level of Take</i>	<i>Conservation Measures to Avoid, Minimize, and Mitigate Impacts</i>	<i>Summary of Expected Outcomes</i>
MacNeill's sootywing skipper	<ul style="list-style-type: none"> <li>Potential for direct mortality of individuals associated with implementation of flow-related covered activities over the term of the LCR MSCP</li> </ul>	<p>AMM1 – To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats</p> <p>AMM5 – Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area</p> <p>MRM2 – Monitor and adaptively manage created covered and evaluation species habitats</p> <p>MNSW1 – Conduct surveys and research to locate MacNeill's sootywing skipper habitat and to better define its habitat requirements</p> <p>MNSW2 – Create at least 222 acres of MacNeill's sootywing skipper habitat</p> <p>CMM1 – Reduce risk of loss of created habitat to wildfire</p> <p>CMM2 – Replace created habitat affected by wildfire</p>	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the MacNeill's sootywing skipper.
Sticky buckwheat	<ul style="list-style-type: none"> <li>Potential for direct mortality of individuals associated with implementation of flow-related covered activities over the term of the LCR MSCP</li> </ul>	STBU1 – Provide funding to support existing sticky buckwheat conservation programs	Implementation of conservation measures achieves the goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation and reduce likelihood of future Federal listing of the species.

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**Table 2.1-3. Summary of Impacts on Covered and Evaluation Species and Estimated Level of Take Associated with Implementation of Flow- and Non-Flow-Related Covered Activities and the Conservation Plan**

<i>Species</i>	<i>Impacts and Estimated Level of Take</i>	<i>Conservation Measures to Avoid, Minimize, and Mitigate Impacts</i>	<i>Summary of Expected Outcomes</i>
Threecorner milkvetch	<ul style="list-style-type: none"> <li>Potential for direct mortality of individuals associated with implementation of flow-related covered activities over the term of the LCR MSCP</li> </ul>	THMI1 – Provide funding to support existing threecorner milkvetch conservation programs	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the threecorner milkvetch, and reduce the likelihood of future Federal listing of the species.
<b>EVALUATION SPECIES</b>			
California leaf-nosed bat (roosting habitat)	<ul style="list-style-type: none"> <li>Potential for likely small, unmeasurable, effects on the production and abundance of insect prey associated with implementation of flow-related activities</li> </ul>	<p>MRM1 – Conduct surveys and research to better identify covered and evaluation species habitat requirements</p> <p>MRM2 – Monitor and adaptively manage created covered and evaluation species habitats</p> <p>CLNB1 – Conduct surveys to locate California leaf-nosed bat roost sites</p> <p>CLNB2 – Create covered species habitat near California leaf-nosed bat roost sites</p> <p>CMM1 – Reduce risk of loss of created habitat to wildfire</p> <p>CMM2 – Replace created habitat affected by wildfire</p>	Implementation of the conservation measures would fully mitigate flow-related impacts, if any, on the diversity and production of insects. In addition, implementation of survey and research conservation measures would provide important information for use in developing future conservation efforts for this species.

**Table 2.1-3. Summary of Impacts on Covered and Evaluation Species and Estimated Level of Take Associated with Implementation of Flow- and Non-Flow-Related Covered Activities and the Conservation Plan**

<i>Species</i>	<i>Impacts and Estimated Level of Take</i>	<i>Conservation Measures to Avoid, Minimize, and Mitigate Impacts</i>	<i>Summary of Expected Outcomes</i>
Pale Townsend's big-eared bat (roosting habitat)	<ul style="list-style-type: none"> <li>No impacts expected</li> </ul>	<p>MRM1 – Conduct surveys and research to better identify covered and evaluation species habitat requirements</p> <p>MRM2 – Monitor and adaptively manage created covered and evaluation species habitats</p> <p>PTBB1 – Conduct surveys to locate pale Townsend's big-eared bat roost sites</p> <p>PTBB2 – Create covered species habitat near pale Townsend's big-eared bat roost sites</p> <p>CMM1 – Reduce risk of loss of created habitat to wildfire</p> <p>CMM2 – Replace created habitat affected by wildfire</p>	Implementation of the conservation measures would fully mitigate flow-related impacts, if any, on the diversity and production of insects. In addition, implementation of survey and research conservation measures will provide important information for use in developing future conservation efforts for this species.
Colorado River toad	<ul style="list-style-type: none"> <li>No impacts expected</li> </ul>	<p>CRT01 – Conduct research to better define the distribution, habitat requirements, and factors that are limiting the distribution of the Colorado River toad</p> <p>CRT02 – Protect existing unprotected occupied Colorado River toad habitat</p> <p>CRT03 – Conduct research to determine feasibility of establishing the Colorado River toad in unoccupied habitat</p>	Implementation of the conservation measures would provide information necessary for successful management to maintain and increase the abundance of the Colorado River toad throughout its range.
Lowland leopard frog	<ul style="list-style-type: none"> <li>No impacts expected</li> </ul>	<p>LLFR1 – Conduct research to better define the distribution, habitat requirements, and factors that are limiting the distribution of the lowland leopard frog</p> <p>LLFR2 – Protect existing unprotected occupied lowland leopard frog habitat</p>	Implementation of the conservation measures would provide information necessary for successful

**Table 2.1-3. Summary of Impacts on Covered and Evaluation Species and Estimated Level of Take Associated with Implementation of Flow- and Non-Flow-Related Covered Activities and the Conservation Plan**

<i>Species</i>	<i>Impacts and Estimated Level of Take</i>	<i>Conservation Measures to Avoid, Minimize, and Mitigate Impacts</i>	<i>Summary of Expected Outcomes</i>
		LLFR3— Conduct research to determine feasibility of establishing the lowland leopard frog in unoccupied habitat	management to maintain and increase the abundance of lowland leopard frogs throughout its range.
<p>a The estimated effects on covered species habitats that would result from implementation of the Federal non-flow-related covered activities addressed in the LCR MSCP BA. The amount of land cover types to be created to provide covered species habitats described in section 2.1.1 includes the creation of sufficient land cover to provide covered species habitat to mitigate both the impacts of implementing the LCR MSCP HCP and the Federal non-flow-related activities on covered species habitats.</p> <p>b The LCR MSCP currently estimates that about two-thirds of LCR MSCP created habitat would be created on agricultural lands (5,045 acres), including associated infrastructure (estimated to be 1 percent of all habitat created, or 81 acres). Agricultural lands provide little or no habitat value for covered and evaluation species.</p> <p>The LCR MSCP impact assessment also assumes that up to 512 acres of existing degraded or former marsh that may provide low-value habitat could be converted to create fully functioning marsh that provides high-value Yuma clapper rail, western least bittern, California black rail, and Colorado River cotton rat habitat. Up to 360 acres of existing degraded or former backwaters could also be converted to create fully functioning backwaters that provide high-value habitat for the bonytail, razorback sucker, and flannelmouth sucker. Conversion of existing degraded or former marsh and backwaters to create habitat for these species, however, would not result in a loss of existing habitat.</p> <p>The remainder of LCR MSCP habitat (currently estimated to be 2,377 acres) would be created on additional lands that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals of one or more covered species, but are not considered to be habitat. These land cover types would be lost and replaced with habitats designed to be of higher value for the covered species. Implementation of the avoidance and minimization measures described in section 2.1.1.5, however, would reduce the likelihood of incidental take of covered species that could be associated with removal of these land cover types.</p> <p>c Includes 610 acres of honey mesquite IV that provides Arizona Bell's vireo habitat that could be converted to agricultural uses and that are covered under the LCR MSCP. Up to an additional 3,832 acres of honey mesquite IV that provides habitat could be removed by Federal non-flow-related activities, however, these activities and resultant impacts are not covered under the LCR MSCP.</p>			

1 The LCR MSCP has a commitment to use scientific information, scientific methods, principles,  
2 and standards to implement the Conservation Plan throughout the term of the LCR MSCP. This  
3 science-based strategy for implementing the LCR MSCP primarily applies to four major  
4 elements of the Conservation Plan: fish augmentation, habitat creation, monitoring and  
5 research, and adaptive management. The LCR MSCP planning processes for implementing  
6 conservation measures would incorporate both internal and external science review.

7 Internal reviews would focus on cost effectiveness of techniques for implementing conservation  
8 measures, chronology of implementation, and inter-relationships of Conservation Plan  
9 components. Internal reviews would consider the following:

- 10 • The current knowledge of the ecology and life requirements of covered species;
- 11 • Knowledge gained through applied research undertaken by the LCR MSCP and others;  
12 and
- 13 • The effectiveness of conservation measures and the status of the species and their  
14 habitats, including the results and progress of concurrent research, conservation,  
15 restoration, and recovery programs for LCR MSCP covered species undertaken  
16 elsewhere in the Colorado River Basin.

17 External reviews would be conducted by recognized experts in the field of study or program  
18 under review. The need for and timing of external review of specific elements of the LCR  
19 MSCP would be determined by the Program Manager and the number of reviewers required  
20 would be determined by the complexity of the LCR MSCP element under review.

21 Baseline conditions would be assessed before implementing conservation measures that create  
22 covered species habitats, augment populations, or other species-specific conservation measures  
23 (e.g., control brown-headed cowbirds to reduce the incidence of nest parasitism). This  
24 assessment of baseline conditions would provide the basis for assessing the success of  
25 conservation measures. Methods to implement conservation measures would be developed  
26 based on the best available scientific information, the efficacy of the methods would be  
27 monitored during implementation, and the effectiveness of the conservation measures would be  
28 monitored following implementation. Ineffective measures would be evaluated and, if feasible,  
29 modified to improve their effectiveness. Where conservation measures cannot be effectively  
30 modified, replacement conservation measures would be developed and implemented.

#### 31 **2.1.1.2 Geographic Scope of the Project**

32 This alternative would be implemented in the planning area, which is the historic floodplain of  
33 the LCR, from Lake Mead to the SIB between the United States and Mexico and areas with  
34 elevations up to and including the full pool elevations of Lake Mead, Lake Mohave, and Lake  
35 Havasu (Figure 1.1-1). The historic floodplain includes all lands that are or have been affected  
36 by the meandering or regulated flows of the Colorado River, which historically have been  
37 confined by the change in elevation that forms the adjoining uplands. The full pool elevation of  
38 Lake Mead is defined by water surface elevation 1,229 feet National Geodetic Vertical Datum  
39 (NGVD). The full pool elevation of Lake Mohave is defined by surface water elevation 647 feet  
40 NGVD. The full pool elevation of Lake Havasu is defined by surface water elevation 450 feet

NGVD. These reservoir full pool surface elevations correspond to the top of the respective spillway gates (USBR 1981).

The planning area is located within seven counties in the states of Arizona, California, and Nevada: La Paz, Mohave, and Yuma counties in Arizona; Imperial, Riverside and San Bernardino counties in California; and Clark County in Nevada. It comprises approximately 720,000 acres, including open water, and consists of Federal, state, tribal, and privately owned lands, as shown in Table 2.1-4. This table does not include acreage for open water areas.

**Table 2.1-4. Land Ownership in the Planning Area**

Land Owner	River Reach (acres)							
	1	2	3	4	5	6	7	TOTAL
U.S. Bureau of Reclamation	0	0	18	0	0	0	0	18
U.S. Fish & Wildlife Service	0	0	20,615	16,672	10,791	497	0	48,575
National Park Service	57,068	12,189	115	0	0	0	0	69,372
Tribal Land	1,775	0	29,118	145,901	0	11,057	1,704	189,555
Bureau of Land Management	0	0	7,379	12,959	2,312	9,118	911	32,679
State	0	0	8,841	5,055	1,630	5,327	1,612	22,465
Private	148	2,892	24,242	109,342	2,091	36,756	57,576	233,047
<b>Total</b>	58,991	15,081	90,310	289,929	16,824	62,755	61,803	595,693
<i>Note:</i> Acreage does not include open water.								

For purposes of this analysis, the portion of the LCR in the planning area is divided into seven reaches. Water surface elevations and river miles (RM) used in defining these reaches are based on maps developed by Reclamation (USBR 1976)<sup>1</sup>. The reaches are shown on Figures 2.1-1 to 2.1-7 and described below:

- *Reach 1:* from Separation Canyon in the lower end of the Grand Canyon to Hoover Dam, including Lake Mead up to full-pool elevation.
- *Reach 2:* from Hoover Dam to Davis Dam (RM 276), including Lake Mohave up to full-pool elevation.
- *Reach 3:* from Davis Dam (RM 276) to Parker Dam (RM 192.3), including Lake Havasu up to full-pool elevation.
- *Reach 4:* from Parker Dam (RM 192.3) to Adobe Ruin and Reclamation's Cibola Gage (RM 87.3) at the lower end of Reclamation's maintenance Cibola Division.
- *Reach 5:* from Reclamation Cibola Gage (RM 87.3) to Imperial Dam (RM 49.2).

<sup>1</sup> River miles are numbered along the thalweg of the LCR channel south to north starting with RM 0.0 at the SIB with Mexico. Backwaters are identified by river mile by using the first letter of the state the backwater is located in (Arizona, California, or Nevada) and the river mile distance from the SIB to the point of connection between the backwater and the river (e.g., C60.7). Dam locations are noted at their respective river miles.

- *Reach 6:* from Imperial Dam (RM 49.2) to the NIB (RM 23.1) between the United States and Mexico.
- *Reach 7:* portion of the LCR from the NIB (RM 23.1) to the SIB (RM 0.0) within the United States.

A certain amount of conservation would be implemented within specific river reaches, as follows:

- The created backwaters would be located in Reaches 3–6; at least 90 acres would be created in Reaches 3 and 4 with water depth, vegetation, and substrate characteristics that provide bonytail habitat. At least 85 acres would be created in Reach 3 with water depth, vegetation, and substrate characteristics that provide the elements of flannelmouth sucker habitat. Additional habitat could also be provided depending on the extent of connected backwaters that are established for the razorback sucker in Reach 3.
- Within the range of the MacNeill’s sootywing skipper (Reaches 1–4), honey mesquite would be planted with quailbush to create the honey mesquite–quailbush interface that provides habitat for this species.
- The created cottonwood–willow land cover would include 76 acres in Reaches 6 and 7 to provide habitat for the Yuma hispid cotton rat; 600 acres would be created in Reaches 3–5 to provide habitat for the elf owl; 4,050 acres would be created in Reaches 3–6 to provide habitat for the gilded flicker; and 1,702 acres would be created in Reaches 3–6 to provide habitat for Gila woodpecker. Note that these acreages are not additive; created land cover types may provide habitat for more than one species.
- At least 125 acres of the created marsh would be located in Reaches 3 and 4 for the Colorado River cotton rat, and 130 acres would be created in Reaches 5 and 6 for the California black rail.

### 2.1.1.3 Conservation Concepts

The following types of conservation measures have been developed to offset take and provide benefits to covered species:

- Maintaining important existing habitat areas;
- Creating and maintaining new habitat for covered species;
- Augmenting populations of covered fish species;
- Supporting other programs to implement conservation measures to benefit covered species; and
- Timing of implementing conservation measures.

### *Maintenance of Existing Habitat*

The LCR MSCP would contribute to maintaining the condition of a portion of existing habitat for southwestern willow flycatcher, yellow-billed cuckoo, Yuma clapper rail, and California



black rail within the planning area. The key elements of the LCR MSCP approach to maintain existing important habitat areas are described below.

- The LCR MSCP would establish a \$25 million fund contribution early in the term of the program in an interest-bearing account to be expended on assessing and implementing projects for maintaining existing habitat.
- Habitat maintenance activities could occur anywhere within the planning area and may be implemented through funding projects by any appropriate agency in the planning area.
- Habitat maintenance activities would be developed and implemented in cooperation with the managing agency for the property on which the activity would occur.
- Selection of habitat maintenance activities funded by the LCR MSCP would be determined based on a set of criteria to be developed by the LCR MSCP in conjunction with the Service. Criteria would be designed to ensure the activities are consistent with the goal of habitat maintenance, goals for covered species, and the overall goals of the Conservation Plan. General criteria that would be developed to select habitat maintenance projects to be funded under the LCR MSCP would include documented evidence that:
  - The habitat has degraded following approval of the LCR MSCP.
  - The habitat can be improved to meet the same standards as described for covered species habitats to be created under the Conservation Plan.
  - The extent of the habitat area encompassed by the project is sufficient to meet the needs of the covered species.
  - The project is economically justified.
  - Cost sharing from the applicant is sufficient.

Special consideration may be given to award grants for equipment and other items to support continuous maintenance programs on a broad scale.

- The habitat maintenance fund would be administered by the Program Manager, primarily through award of grants to participating agencies.
- Types of activities that could be conducted include construction of infrastructure for water delivery or movement; maintenance of marsh vegetation by burning, water delivery, and other means; maintenance of moist soil conditions in riparian land cover types (e.g., cottonwood-willow); dredging activities to create backwaters or backwater connection with the main river channel; removal or control of undesirable vegetation such as saltcedar and *Arundo*; and other appropriate means to maintain existing desirable habitat.

### *Habitat Creation*

This section describes conservation measures for creating cottonwood-willow, honey mesquite, marsh, and backwater land cover types to provide covered species habitat. Habitat creation involves the direct construction of habitat that results in new habitat at sites that do not

presently support habitat (e.g., establishment of cottonwood-willow stands or marsh that provides habitat for covered species on existing agricultural lands). To the extent practicable based on site conditions, cottonwood-willow, honey mesquite, marsh, and backwaters would be created in proximity to each other to recreate integrated mosaics of habitat that approximate the relationship among aquatic and terrestrial communities historically present along the LCR floodplain.

The LCR MSCP would design and create the following amounts of each land cover type in a manner that would provide habitat for covered species that could be affected by covered activities and Conservation Plan implementation:

- 5,940 acres of cottonwood-willow;
- 1,320 acres of honey mesquite type III;
- 512 acres of marsh; and
- 360 acres of backwaters.

The extent of each created land cover type and the extent of created habitat the land cover types would provide for each covered species are summarized in Table 2.1-5. Patches of created land cover, in most instances, would be designed and managed to provide habitat for more than one covered species. Patches of land cover can support habitat for one or more covered species, although how each species may use the same patch of land cover may differ. For example, habitat for one species may be supported by the upper layers of canopy in a stand of riparian land cover, while habitat for another may be supported by the understory vegetation. Therefore, affected vegetation that provides habitat for more than one covered species can be replaced within the same footprint of created land cover, where the established land cover supports the habitat elements of each covered species. Species for which habitat can be created within the same area of land (if elements of each species' habitat are present and accessible to the species) are illustrated in Figure 2.1-8 (cottonwood-willow) and Figure 2.1-9 (cottonwood-willow and marsh land cover). Lands on which land cover types are created to provide habitat for covered species would be located within designated conservation areas under the management of the LCR MSCP Program Manager.

The length of time that created habitats would be maintained under the LCR MSCP is dependent on the duration of the effects of the covered activities on covered species (the covered activities include both those that would result in permanent loss of habitat and those that would not). The LCR MSCP commits to maintaining in perpetuity the habitat created to address permanent impacts of implementing the covered activities. This commitment would be accomplished through a variety of management options, including transfer of purchased mitigation land to a Federal, state, or appropriate private entity for permanent management for wildlife values, or creating habitat on existing protected lands. Agreement by the managing entity to maintain the habitat would be acquired or, if necessary, endowments for the maintenance of the properties would be provided within the LCR MSCP budget.

**Table 2.1-5. Extent of Covered Species Habitat That Would Be Provided with the Establishment of Land Cover Types  
(Page 1 of 3)**

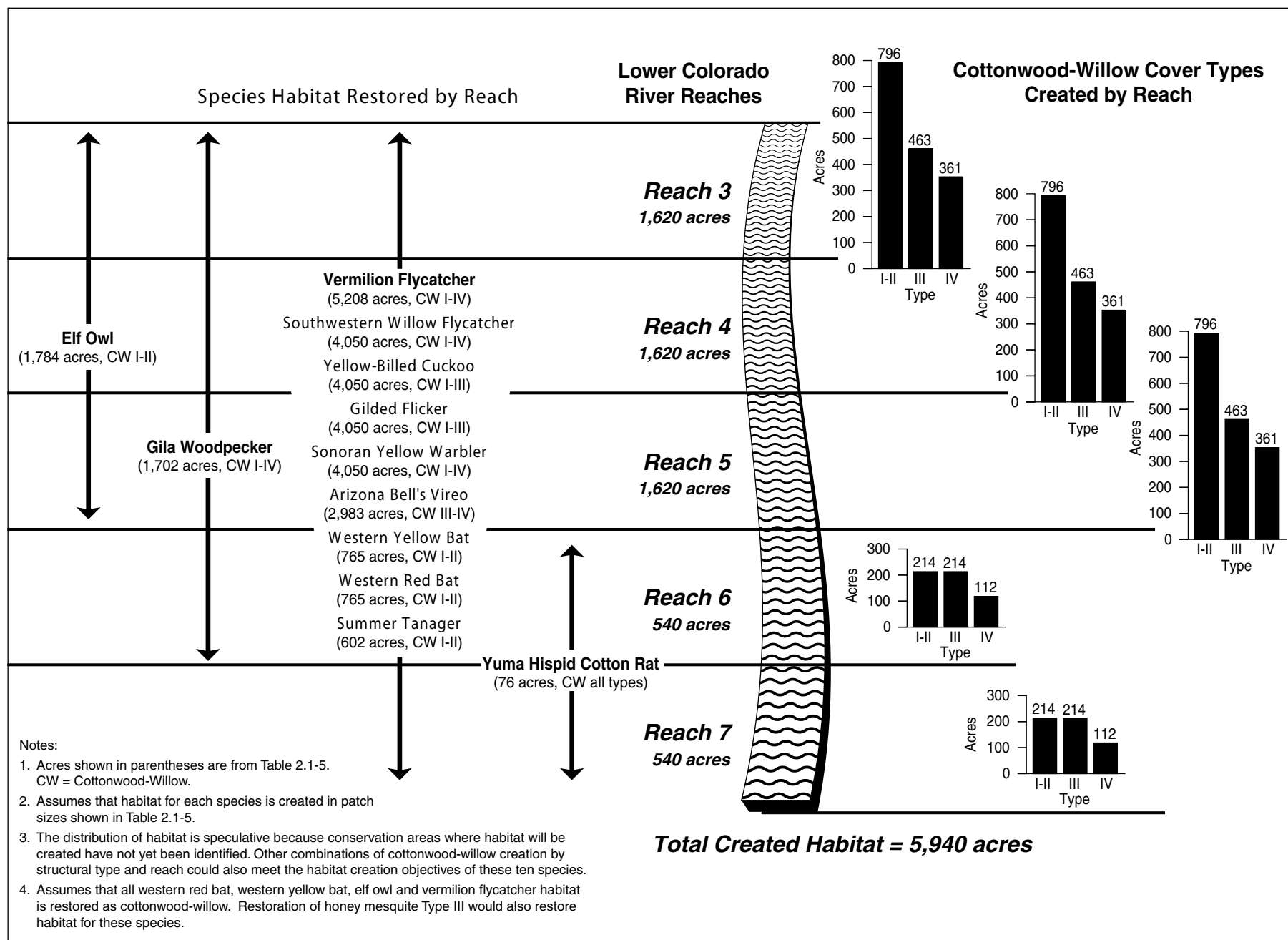
<i>Created Land Cover Type</i>	<i>Species Habitat Provided by the Created Land Cover Type</i>
Create a total of 5,940 acres of cottonwood-willow	Southwestern willow flycatcher: <ul style="list-style-type: none"> <li>2,700 acres would be created as cottonwood-willow types I-III with moist surface soil conditions during the breeding season</li> <li>1,350 acres would be created as cottonwood-willow types I-IV with moist surface soil conditions during the breeding season</li> </ul>
	Western red bat: <ul style="list-style-type: none"> <li>175 acres would be created as cottonwood-willow types I and II to provide roosting habitat<sup>a</sup></li> </ul>
	Western yellow bat: <ul style="list-style-type: none"> <li>175 acres would be created as cottonwood-willow types I and II to provide roosting habitat<sup>a</sup></li> </ul>
	Yuma hispid cotton rat: <ul style="list-style-type: none"> <li>76 acres would be created in Reaches 6 and 7 that support a moist herbaceous understory, including openings in the canopy to allow for the establishment and growth of herbaceous vegetation</li> </ul>
	Yellow-billed cuckoo: <ul style="list-style-type: none"> <li>2,700 acres would be created as cottonwood-willow types I-III with moist surface soil conditions during the breeding season</li> <li>1,350 acres would be created as cottonwood-willow types I-III</li> </ul>
	Elf owl: <ul style="list-style-type: none"> <li>600 acres would be created as cottonwood-willow types I and II in Reaches 3-5<sup>b</sup></li> </ul>
	Gilded flicker: <ul style="list-style-type: none"> <li>4,050 acres would be created as cottonwood-willow types I-III in Reaches 3-7</li> </ul>
	Gila woodpecker: <ul style="list-style-type: none"> <li>1,702 acres would be created as cottonwood-willow types I-IV in Reaches 3-6</li> </ul>
	Vermilion flycatcher: <ul style="list-style-type: none"> <li>4,008 acres would be created as cottonwood-willow types I-IV</li> </ul>
	Arizona Bell's vireo: <ul style="list-style-type: none"> <li>1,763 acres would be created as cottonwood-willow types III and IV</li> </ul>
	Sonoran yellow warbler: <ul style="list-style-type: none"> <li>4,050 acres would be created as cottonwood-willow types I-IV</li> </ul>

**Table 2.1-5. Extent of Covered Species Habitat That Would Be Provided with the Establishment of Land Cover Types**  
(Page 2 of 3)

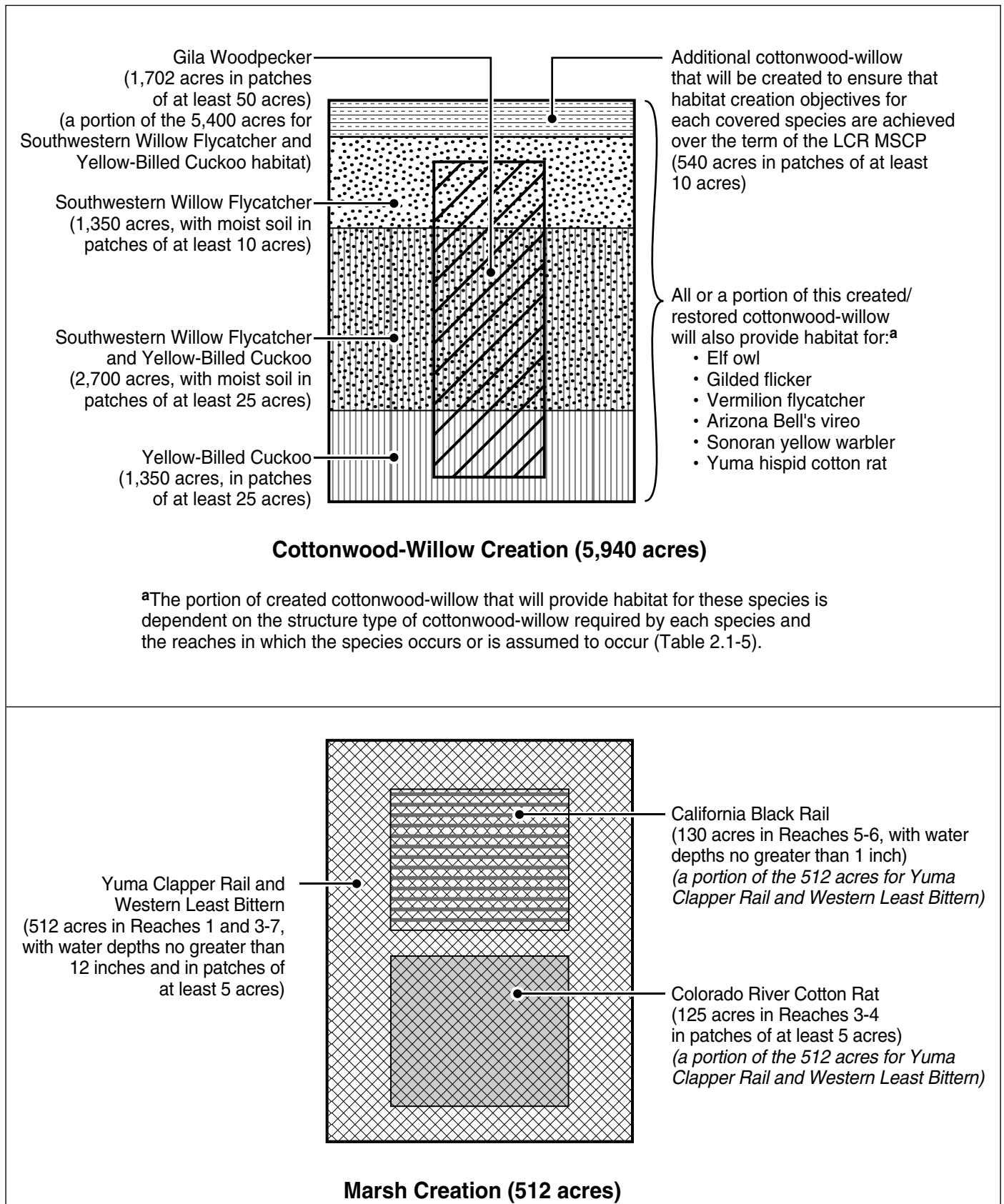
<i>Created Land Cover Type</i>	<i>Species Habitat Provided by the Created Land Cover Type</i>
	Summer tanager: <ul style="list-style-type: none"> <li>602 acres would be created as cottonwood-willow types I and II</li> </ul>
Create a total of 1,320 acres of honey mesquite III	Western red bat: <ul style="list-style-type: none"> <li>590 acres would be created to provide roosting habitat<sup>a</sup></li> </ul>
	Western yellow bat: <ul style="list-style-type: none"> <li>590 acres would be created to provide roosting habitat<sup>a</sup></li> </ul>
	Elf owl: <ul style="list-style-type: none"> <li>1,184 acres would be created in Reaches 3–5<sup>b</sup></li> </ul>
	Vermilion flycatcher: <ul style="list-style-type: none"> <li>1,200 acres would be created</li> </ul>
	Arizona Bell's vireo: <ul style="list-style-type: none"> <li>1,200 acres would be created</li> </ul>
	MacNeill's sootywing skipper: <ul style="list-style-type: none"> <li>222 acres would be created with quail bush to create the honey mesquite–quail bush edge required by this species near existing occupied habitat in Reaches 1–4</li> </ul>
Create a total of 512 acres of marsh	Yuma clapper rail: <ul style="list-style-type: none"> <li>512 acres would be created with water depths no greater than 12 inches</li> </ul>
	Colorado River cotton rat: <ul style="list-style-type: none"> <li>120 acres would be created in Reaches 3 and 4</li> </ul>
	Western least bittern: <ul style="list-style-type: none"> <li>512 acres would be created with water depths no greater than 12 inches</li> </ul>
	California black rail: <ul style="list-style-type: none"> <li>130 acres would be created with water depths no greater than 1 inch in Reaches 5 and 6</li> </ul>
Create a total of 360 acres of backwater	Bonytail: <ul style="list-style-type: none"> <li>360 acres would be created in Reaches 3–6 that contain the physical, chemical, and biological conditions required to support native LCR fishes in a healthy condition</li> </ul>

**Table 2.1-5. Extent of Covered Species Habitat That Would Be Provided with the Establishment of Land Cover Types**  
(Page 3 of 3)

<i>Created Land Cover Type</i>	<i>Species Habitat Provided by the Created Land Cover Type</i>
	Razorback sucker: <ul style="list-style-type: none"> <li>360 acres would be created in Reaches 3–6 that contain the physical, chemical, and biological conditions required to support native LCR fishes in a healthy condition</li> </ul>
	Flannelmouth sucker: <ul style="list-style-type: none"> <li>Up to 85 acres would be created in Reach 3 that contain the physical, chemical, and biological conditions required to support native LCR fishes in a healthy condition</li> </ul>
<p><i>Notes:</i></p> <p>a Cottonwood-willow types I and II and honey-mesquite type III provide roosting habitat for this species. The LCR MSCP Conservation Plan would provide a total of 765 acres of habitat for this species by creating a combination of 765 acres of cottonwood-willow types I and II and honey mesquite type III land cover type. The quantity of each created land cover type presented in this table is for illustrative purposes only—the actual amount of each land cover type that would be created to provide habitat for this species would depend on a number of factors, including site availability and conditions for creating each of the land cover types. For example, the habitat creation objective of 765 acres for this species could also be achieved by creating 100 acres of cottonwood-willow types I and II and 665 acres of honey mesquite type III.</p> <p>b Cottonwood-willow types I and II and honey-mesquite type III provide elf owl habitat. The LCR MSCP Conservation Plan would provide a total of 1,784 acres of habitat for this species by creating a combination of 1,784 acres cottonwood-willow types I and II and honey mesquite type III. The quantity of each created land cover type presented in this table is for illustrative purposes only—the actual amount of each land cover type that would be created to provide elf owl habitat would depend on a number of factors, including site availability and conditions for creating each of the land cover types. For example, the habitat creation objective of 1,784 acres for this species could also be achieved by creating 1000 acres of cottonwood-willow types I and II and 784 acres of honey mesquite type III.</p>	



**Figure 2.1-8. Hypothetical Distribution of Cottonwood-Willow Creation that Would Meet Habitat Requirements for all Covered Species Associated with Cottonwood-Willow**



**Figure 2.1-9. Proportion of Created Cottonwood-Willow and Marsh that would Provide Habitat for Selected Covered Species**

### COTTONWOOD-WILLOW

Cottonwood-willow land cover would be created to provide the habitat elements for the covered species that use this land cover type, as shown on Table 2.1-5. The Conservation Plan would replace 2,132 acres of cottonwood-willow that would be removed or could be degraded by non-flow and flow-related covered activities with 5,940 acres of created and actively managed cottonwood-willow of higher quality than the affected land cover.

Cottonwood-willow would be created in specific patches of land cover types, such as saltcedar and agricultural lands, that are not considered to support habitat for cottonwood-willow associated covered species. To the extent practicable, cottonwood-willow would be created in conjunction with honey mesquite, *Atriplex* spp., other native riparian species, and marsh and backwater vegetation to meet the habitat requirements of the covered species and to create an integrated mosaic of functional habitats. In addition, creation of large patches of habitat would reduce the likelihood for cowbird nest parasitism on several covered bird species whose populations have declined and are now being affected by nest parasitism. Creation of cottonwood-willow in patches suitable for these species would also meet the habitat patch requirements for other riparian-associated covered species.

Depending on site-specific conditions, creation of cottonwood-willow stands may require creating canals and seasonally wet swales, creating some topographic diversity, and planting or seeding the site with cottonwoods, willows, honey mesquite, and other native riparian species, such as quail bush and saltbush. It is anticipated that most created cottonwood-willow land cover would be flood irrigated. After planting or seeding, removal of saltcedar and management of other invasive exotic species may be required. Created cottonwood-willow designed to provide southwestern willow flycatcher habitat would be specifically managed to ensure that moist surface soil, slow-moving water, or ponded water conditions are present during the breeding season to ensure the production of the flycatcher's flying insect prey base. Once established, patches of created cottonwood-willow would be actively managed to maintain the seral stages and other patch attributes that are required habitat elements for the covered species for which each patch of created cottonwood-willow is intended to provide habitat.

Major design elements for creating cottonwood-willow as habitat for covered species include the following:

- creating large blocks of cottonwood-willow forest necessary to provide yellow-billed cuckoo habitat interspersed with bands of honey mesquite established at higher site elevations;
- excavating and supplying water to canals and shallow swales that dissect blocks of created forest to provide water and forest-edge conditions necessary to support southwestern willow flycatcher habitat, create the microrelief and soil moisture conditions necessary to support a diversity of understory plant species, and distribute irrigation water;
- actively managing created forest to maintain the seral stages required by covered species;



- irrigating to water and establish planted cottonwood-willow and mesquite seedlings (once stands have become established, ongoing maintenance of the native vegetation would include limiting establishment of saltcedar and other nonnative species to maintain habitat quality for associated covered species); and
- periodically irrigating, when necessary, to prevent the buildup of salts in the soil.

Successful creation of cottonwood-willow riparian forest requires that the physical processes that determine habitat structure and dynamics in riparian systems be mimicked as much as possible. In suitable locations, this component of the Conservation Plan would include mimicking overbank flooding by flood irrigation, in particular in the spring and early summer, but also later in the season to maintain a shallow groundwater table. Maintaining a shallow groundwater table would help maintain herbaceous understory vegetation as well as woody riparian vegetation. Creation would also include seeding of cottonwoods and willows during the natural dispersal period or allowing for self-seeding. Following the establishment of vegetation, irrigation would continue as needed to maintain moist soil conditions during the breeding season for covered bird species and to prevent the buildup of salts in the soil. In addition, stands would be managed to maintain the seral stages required by the covered species and the essential habitat parameters and minimum habitat area requirements for the southwestern willow flycatcher, western yellow-billed cuckoo, and other riparian-associated covered species. Monitoring and research through the adaptive management process would guide cottonwood-willow habitat management. (Active management may include apical pruning, bole reduction, vegetative propagation via willow limb and bole prostration in moist soil.)

#### HONEY MESQUITE

The Conservation Plan would replace 590 acres of honey mesquite land cover type III that provide habitat for the elf owl, vermilion flycatcher, and Arizona Bell's vireo and that would be removed by non-flow-related activities with 1,320 acres of established and actively managed honey mesquite type III. The composition and structure of the established honey mesquite land cover would be consistent with Anderson and Ohmart's (1976, 1984a) vegetation classification type III. Honey mesquite would be created in conjunction with created cottonwood-willow and backwaters to create an integrated mosaic of habitats. Depending on site-specific conditions, honey mesquite may be created in small patches or as bands within created cottonwood-willow and adjacent to backwaters at suitable site elevations or as larger patches (e.g., greater than 50 acres) adjoining created or existing habitats. It is anticipated that creation of large blocks of honey mesquite generally would require removing existing saltcedar-dominated stands of riparian vegetation or clearing agricultural land, planting and irrigating honey mesquite seedlings, and seeding or planting native understory vegetation. Quail bush, saltbush, and other native riparian vegetation may also be planted along the perimeter of created honey mesquite where topography and soil conditions are suitable.

#### MARSH

The Conservation Plan would replace 243 acres of marsh that provide habitat for covered species and could be removed or degraded by covered activities with 512 acres of marsh that provide habitat for affected covered species. Replacement marsh would be designed and

managed to provide habitat for the Yuma clapper rail, California black rail, western least bittern, and Colorado River cotton rat. Replacement marsh would be provided by creating new marsh in locations with suitable soils and water availability. Patches of new marsh would be created, designed, and managed to provide an integrated mosaic of habitat for the Yuma clapper rail and California black rail. Creation of habitat for these species would also provide habitat for the western least bittern and Colorado River cotton rat. Habitat creation activities could include, but not be limited to the following:

- Creating moist soil units vegetated with bulrush, with infrastructure that would allow water levels to be managed to depths required by the California black rail,
- Dredging and planting emergent vegetation in newly established backwaters and marsh components of conservation areas, and
- Restoring hydrologic conditions in existing degraded, nonfunctional marsh to create marsh that functions as habitat for covered species.

Long-term management activities to maintain the established habitat could include burning, or applying other appropriate management measures, to remove dead mats of emergent vegetation to encourage growth of cattails and bulrush as the established marshes mature.

### BACKWATER

The Conservation Plan would replace 399 acres of backwaters and river channels that provide habitat for the bonytail, razorback sucker, and flannelmouth sucker that would be affected by flow-related activities, with 360 acres of created and actively managed connected and disconnected backwaters. Backwater creation would provide habitat for the razorback sucker and bonytail and provide surface and groundwater hydrology in support of existing or created habitat for southwestern willow flycatcher, western yellow-billed cuckoo, clapper rail, elf owl, and other covered species. Disconnected backwaters isolated from non-native fish communities in the river or reservoirs could provide habitat for a recruiting population of native fish, production facilities (grow-out or harvestable surplus of natural recruitment), and research facilities on habitat use and species interactions and would ultimately serve as refuges for these species. Backwaters that are disconnected from the LCR channel are of considerably higher value to bonytail and razorback sucker in the LCR and are the preferred type to achieve LCR MSCP conservation goals for these species. (Fish reared under the Conservation Plan and stocked into these backwaters would count toward total augmentation numbers for razorback sucker and bonytail, described below.) Connected backwaters would be designed to provide the environmental conditions necessary to support adult or subadult razorback sucker, bonytail, and flannelmouth sucker. Vegetation, substrate, depth, water quality, and continuity with the adjacent river or reservoir are important habitat elements for these species.

Where possible, backwater creation would be combined with the creation of riparian and marsh land cover types to provide a mosaic of land cover types. Backwaters would be designed to provide for the establishment of bulrush and cattail along the edges. Depending on the extent of marsh vegetation established at each site, breeding and/or dispersal habitat may be created for the Yuma clapper rail. Backwater creation within or adjacent to existing or created patches of riparian vegetation provides the two major components of southwestern willow flycatcher breeding habitat—structure for nest site placement and standing water and saturated soils for

production of insect prey. Backwaters, integral to flycatcher breeding habitat, would be designed and managed to maintain standing water and moist soils during the southwestern willow flycatcher breeding season. Where backwaters are created in or adjacent to extensive stands of riparian forest, they would also contribute to maintaining the humid microclimate conditions required by nesting yellow-billed cuckoos.

#### *Fish Augmentation Strategies*

In addition to replacing covered fish species habitat affected by covered activities, the LCR MSCP would rear and stock fish to augment the existing population of razorback sucker and bonytail in the LCR. To offset any potential take of razorback sucker and bonytail, the LCR MSCP commits to providing the level of funding necessary to produce:

- up to 660,000 subadult razorback sucker (at least 300 mm [~12 inches] in length); and
- up to 620,000 bonytail (at least 300 mm [~12 inches] in length).

These augmentations would be structured as described below under “Species-Specific Conservation Measures for Covered Species” in section 2.1.1.5. Funds not used for production of fish would be used for other management actions that would benefit the populations of both species.

Existing fish rearing capacity and aquacultural techniques may initially be insufficient to meet the augmentation objectives described above. Accordingly, in the initial years of Conservation Plan implementation, the LCR MSCP would:

- Monitor the response of razorback suckers to previous augmentations and stock the numbers of razorback sucker that can be produced up to the amounts described above;
- Assess the efficacy of existing or proposed bonytail production programs and facilities and develop the methods required to produce and rear the fish;
- Increase rearing capacity, if necessary, in cooperation among AGFD, CDFG, NDOW, the Service, and other LCR MSCP participants, or fish may be acquired from other sources;
- Construct, in the context of the integrated landscape mosaic, a “pilot project” for isolated backwaters that can be used for recruiting populations, grow-out facilities, or research within the planning area.

The LCR MSCP would also monitor fish response to augmentations and conduct adaptive management experiments to collect information necessary to evaluate and adaptively manage implementation to better ensure program objectives are achieved.

#### *Other Conservation Strategies*

##### CONTRIBUTE TO ONGOING CONSERVATION PROGRAMS

The LCR MSCP would contribute up to \$1.25 million to entities charged with ongoing programs to conserve covered species within and outside of the planning area. Funding would be provided only to implement species conservation actions that have been identified to contribute

to the conservation of the species and for which other funding is not available. Covered species for which the LCR MSCP would fund conservation measures through other ongoing programs include the relict leopard frog, humpback chub, flannelmouth sucker, sticky buckwheat, and threecorner milkvetch.

### COVERED SPECIES POPULATION ENHANCEMENT STRATEGIES

Species-specific population enhancement conservation measures are designed to address species conservation needs that cannot be addressed through maintenance of existing habitat or creation of habitat. Examples of population enhancement measures include collecting wild fish spawn, raising brood and young fish at hatcheries and rearing ponds, and releasing them into the river and backwaters; controlling piscivorous fish and nonnative amphibians in advance of releases into created backwaters; placing nest boxes in created cottonwood-willow land cover to increase nesting success for cavity-nesting species; and controlling brown-headed cowbirds to reduce adverse effects of nest parasitism on covered species. Specific descriptions of population enhancement conservation measures are presented below under “Monitoring and Research Measures” and “Species-Specific Conservation Measures for Covered Species” in section 2.1.1.5.

### PROTECTION OF EXISTING HABITAT

The Conservation Plan is directed toward creating new covered species habitats to replace affected habitats and contribute to the recovery of covered species. Under specific circumstances, however, existing unprotected covered species habitats may be acquired, protected, and managed under the LCR MSCP to prevent their future loss or degradation. If existing habitat is protected under the LCR MSCP, the extent of the protected covered species habitat would be credited in lieu of an equal amount of the applicable covered species habitat to be created under the Conservation Plan (e.g., if 100 acres of existing southwestern willow flycatcher habitat are acquired and protected, 100 fewer acres would be created than is identified in the Conservation Plan). For existing unprotected habitat to be protected and managed under the LCR MSCP, the Program Manager would evaluate each identified property on a case-by-case basis.

### AVOIDANCE AND MINIMIZATION OF IMPACTS

The Conservation Plan includes measures to avoid and minimize impacts of implementing covered activities and the Conservation Plan on covered and evaluation species. Examples of such measures include avoiding declines in groundwater and surface water elevations by installing infrastructure to maintain water elevations and designing LCR MSCP-created habitats to avoid removal of cottonwood-willow land cover and southwestern willow flycatcher habitat. Specific descriptions of avoidance and minimization conservation measures are presented below under “Avoidance and Minimization Measures” and “Species-Specific Conservation Measures for Covered Species” in section 2.1.1.5.

#### **2.1.1.4 Conservation Area Site Selection, Design, and Management**

Conservation areas are lands on which land cover types would be created to mitigate impacts of covered activities and LCR MSCP implementation on existing covered species habitat. Once

established, conservation areas would be maintained and managed to ensure continued habitat persistence and function.

### *Conservation Area Site Selection*

The LCR MSCP would create 8,132 acres of habitat for covered species and would select conservation areas in which to create habitat from the following:

- among 30 potentially suitable habitat establishment sites that have been initially identified, surveyed, and evaluated by the LCR MSCP participants (Ogden Environmental and Energy Services 1999; CH2MHill 1999; SWCA Environmental Consultants 2000; Inter-Agency Team 1999, 2000a, 2000b, 2000c; SAIC/Jones & Stokes 2001
- available agricultural lands; and
- other undeveloped lands.

Approximately 37,500 acres are present in the 30 initially identified conservation area sites (Table 2.1-6, Figure 2.1-10), and approximately 270,500 acres of agricultural lands are present in the planning area (Table 2.1-7). Consequently, sufficient suitable sites are available to the LCR MSCP to successfully create the required 8,132 acres of covered species habitat (representing approximately 3 percent of the lands identified in Tables 2.1-6 and 2.1-7).

The process for selecting conservation areas would involve application of site-selection criteria and require collection of sufficient information to properly evaluate the potential for the successful creation of habitat before conservation areas are acquired. It is the intent of the LCR MSCP participants to create habitats in locations and patch sizes that would best meet the conservation needs of the covered species and to manage those habitats in a manner that would meet species' seasonal habitat requirements, within the constraints associated with land availability. Conservation site-selection criteria include the following:

- presence of and proximity to existing occupied covered species habitats;
- suitability of site conditions for restoring habitat for specific species (e.g., appropriate soils, availability of water for irrigation);
- available requisite infrastructure (e.g., access roads, irrigation-related infrastructure);
- relative suitability for achieving multiple creation objectives through an integrated mosaic of habitat types;
- likelihood for mosquitoes produced on a site to become a vector control or nuisance problem based on proximity to urban areas and mosquito production potential;

Table 2.1-6. Summary of Initially Identified Conservation Areas

Potential Conservation Area	River Mile	Ownership Status <sup>a</sup>	Total Area <sup>b</sup> (acres)	Cottonwood-Willow	Honey Mesquite III	Riparian <sup>c</sup>	Marsh
Hualapai Wilderness Riparian Restoration	GC 243-260	T	60	0	0	60	0
Hualapai Lost Creek Riparian Improvement	GC 247	T	2	1	0	0	0
Lake Mead Riparian Restoration <sup>d</sup>	418-343	F	500	0	0	500	0
Lake Mohave Riparian Restoration <sup>e</sup>	326-278	F	200	ND	ND	ND	ND
Backwaters and Sloughs I	266-264	S	450	100	250	0	50
Cimarron Agricultural Conversion	254-253.3	T	97	97	0	0	0
Long Lake	254-252	T	570	0	0	562	0
Pauite Wash Restoration	251.5	T	630	20	200	0	0
Twin Lakes	251-249	T	165	150	0	0	0
Section 33 Agricultural Conversion	250.5	T	150	150	0	0	0
Section 20 Riparian and Native Fish Rest.	243-244	T	1,326	0	0	1,226	0
Chemehuevi Rearing Pond Cove Enhance.	216-208.5	T	54	ND	ND	ND	ND
Chemehuevi Wilderness Riparian Restoration	212.5-208.5	T	124	124	0	0	0
Chemehuevi Agricultural Conversion	Chem Res	T	40	40	0	0	0
Chemehuevi Desert Wash Revegetation	Chem Res	T	100	ND	ND	ND	ND
'Ahakhav Tribal Preserve	175-169	T	1,010	280	530	0	0
Mohave and Deer Tail Backwaters	169-166	T	800	170	540	0	0
A7 Backwater	121-117	S	1,560	670	590	0	0
A10 Backwater	115-114	F	220	110	80	0	0
Swendt Slough	111-110	S	235	50	160	0	0
Cibola Valley Irrigation and Drainage District	110-107	P	1,030	515	515	0	0
BLM Agricultural Leases within PVID	107-102	F	2,200	2,110	60	0	0
Cibola Meander, Arizona Side	104.5-101.5	P	1,040	700	300	0	0
Palo Verde Oxbow Enhancement	102-100	P,F	1,560	620	20	0	0
Sempre Property Land Acquisition	113-96.5	P	17,000	ND	ND	ND	0
Cibola Restoration Concepts	96-88	R,F	230	70	110	0	0
Laguna Old Channel Restoration	49-43	S	1,425	770	420	0	0
Yuma East Wetlands Pilot Project	34.2-30.8	S,T,F,P	1,305	580	0	0	0
Cocopah Tribal Enhancement Proposal	27-9	T	1,223	0	0	1,223	0
Limitrophe BLM Habitat Restoration	8-0	F	770	740	20	0	0
<b>Acreage Totals</b>			<b>37,526</b>	<b>7,917</b>	<b>3,795</b>	<b>3,571</b>	<b>50</b>

Notes:

ND= no data available

GC= Grand Canyon

Chem Res = Chemehuevi Indian Reservation

BLM = Bureau of Land Management

a Ownership Status Symbols:

F = Federal (non refuge)

R = National Wildlife Refuge

S = State

T = Tribal

P = Private

b The total extent of potential conservation areas may include land cover types (e.g., developed lands and desert scrub) that are not suitable for establishment of covered species habitat. Consequently, the total extent of established habitat may be less than the total extent of the conservation area.

c The design for the specific composition of this created riparian land cover has not yet been developed. Land cover types could include cottonwood-willow, honey mesquite, arrowweed, atriplex, and other riparian land cover types.

d Habitat created in this potential conservation area would be in addition to the Federal covered activities described in the LCR MSCP BA that will also restore habitat at Lake Mead.

e Habitat created in this potential conservation area would be in addition to the Federal covered activities described in the LCR MSCP BA that will also restore habitat at Lake Mohave.

**Table 2.1-7. Agricultural Land by River Reach  
and Landowner Category**

<i>River Reach</i> <sup>1</sup>	<i>Owner Category</i>	<i>Agricultural Land (acres)</i>
Reach 3	Federal/state refuge	222
	Tribal land	11,510
	Private	5,789
	Not identified <sup>2</sup>	0
	Total	19,159
Reach 4	Federal/state refuge	1,551
	Other Federal/state	8,874
	Tribal land	78,061
	Private	81,118
	Not identified <sup>2</sup>	0
	Total	169,604
Reach 5	Federal/state refuge	256
	Other Federal/state	4
	Total	260
Reach 6	Federal/state refuge	65
	Other Federal/state	3,314
	Tribal land	7,292
	Private	25,207
	Not identified <sup>2</sup>	908
	Total	36,786
Reach 7	Other Federal/state	1,847
	Tribal land	883
	Private	41,943
	Not identified <sup>2</sup>	32
	Total	44,705
All Reaches	Federal/state refuge	2,096
	Other Federal/state	15,677
	Tribal land	97,745
	Private	154,057
	Not identified <sup>2</sup>	940
	Grand total	270,514
<p>1 No Lower Colorado River Accounting System agricultural landowner data are available for Reaches 1 and 2. Reaches 1 and 2 do not contain agricultural land because the river in this area is generally bordered by cliffs rather than the broad plains that are conducive to such uses.</p> <p>2 No landowner data is available; however, landowners could include any of the other landowner categories.</p> <p>Sources: USBR 2003a, 2002</p>		

- cost of land acquisition (e.g., fee title, conservation easement, lease);
- timing of availability relative to the need for implementing conservation measures;
- consideration of zoning and general plan designations;
- relative cost of implementing and maintaining established habitat; and
- availability and cost of water to meet establishment and maintenance requirements.

### Conservation Area Design Concepts

Once the location of conservation areas is determined based on the site selection criteria, a conservation area design plan would be developed specific to the conservation area to meet covered species habitat needs. The conservation area design plans would incorporate created habitat, existing habitat if present, and, if necessary, buffer areas to protect conservation area habitats from activities on adjacent lands that could degrade Conservation Plan habitats. Important conservation area design concepts that would guide implementation of the habitat creation element of the Conservation Plan are described below:

1. Habitat would be created in patches equal to or greater than the patch sizes required to support sustainable occupancy of the target-covered species.
2. Conservation areas would be designed to create an integrated mosaic of vegetation to approximate the historical juxtaposition of communities along the LCR. Examples of how this may be accomplished include the following:
  - a. approximating the historical floodplain community by establishing an integrated mosaic of patches of cottonwood-willow, honey mesquite, *Atriplex* spp., other native riparian species, and backwater and emergent vegetation; and
  - b. creating habitat in locations where, in combination with existing adjacent habitat, habitat mosaics are created or enhanced.
3. Created habitat for species with limited distribution along the LCR and with limited ability to move among habitat patches along the LCR would be located near known populations to facilitate future occupancy of created habitats.
4. To create large patches of habitat that would be more likely to support high numbers of associated covered species, priority would be given to creating habitat near existing habitats.
5. To the extent consistent with the conservation area site-selection criteria, preference would be accorded to locating created habitat on Federal, state, and tribal lands. If suitable public lands were not available, private land would be considered on the principle of willing seller or lessor. Preference also would be given to acquisition and design of large patches.
6. Management of conservation areas includes a commitment to:
  - a. reduce the risk of the loss of created habitat to wildfire by providing resources to suppress wildfires (e.g., contributing to and integrating with local, state, and Federal agency fire management plans),



- b. design conservation areas to contain wildfire and facilitate rapid response to suppress fires (e.g., fire management plans would be an element of each conservation area management plan), and
  - c. implement land management and habitat creation measures in conservation areas to support the re-establishment of native vegetation that is lost to wildfire or other destructive events.
7. Conservation areas would, as needed, incorporate buffer areas to minimize the potential effects of wildfire, existing land uses, and other activities that may be associated with adjacent lands that could adversely affect the ecological functions associated with established habitats. Conservation areas would be designed to minimize the need for buffers by locating, juxtaposing, and managing established habitats in a manner that would minimize the effect of activities/events that may occur on adjacent lands. The need for buffer lands would be determined based on the site-specific needs identified for each conservation area. Lands acquired and designated as buffers for conservation areas would not be lands that are established as covered species habitat. In order to avoid potential impacts to aircraft from increases in bird populations, the conservation measures would be implemented in compliance with Federal Aviation Administration (FAA) Guidelines.
8. Conservation areas would be located and designed to incorporate, to the greatest extent practicable, existing infrastructure and to minimize the need for construction of new infrastructure required for establishment and management of habitats. The extent of land required for new infrastructure to manage conservation areas would be based on site-specific needs identified for each conservation area, and lands required for new infrastructure would be in addition to lands enhanced and established as covered species habitat.
9. Design and management of conservation areas would be coordinated with appropriate local health officials to incorporate, to the extent practicable, design and management concepts to help reduce the likelihood that conservation areas do not produce mosquitoes in numbers that could cause public health or nuisance concerns. Access to conservation areas would be provided to appropriate health officials to monitor mosquito populations.

### *Conservation Area Management*

A management plan would be developed and implemented for each conservation area. Major elements addressed by the management plans would include:

- Habitat objectives of the conservation area;
- Monitoring requirements;
- Fire management;
- Predator/competitor management;
- Vegetation management;
- Infrastructure maintenance;

- Permitted uses; and
- Water management.

It is anticipated that conservation area management plans would need to be periodically revised to reflect new information that is collected through monitoring and research (section 2.1.1.7).

### *Conservation Area Mainstream Water Use and Management*

#### WATER SUPPLY

The diversion and consumptive use of Colorado River water is governed by the Law of the River. Key concepts are described below, and additional detail is included in Appendix A. The concepts of “apportionment” and “entitlement” are key to understanding the allocation of Colorado River water. “Apportionment” refers to the distribution of Colorado River water between the Upper and Lower Basin States as identified in the Colorado River Compact of 1922 (Compact), and within the Lower Basin States as identified in the Boulder Canyon Project Act (BCPA) and the *Arizona v. California* 1964 Supreme Court Decree (Decree). The Compact apportioned Colorado River water between the Upper and Lower basins, giving in perpetuity to each basin the exclusive beneficial consumptive use of 7.5 million af per year (maf). Under the BCPA and the Decree, Colorado River water within the Lower Division States was apportioned among the states; 2.8 maf to Arizona, 4.4 maf to California, and 300 thousand af per year (kaf) to Nevada. The Decree further defined each state’s apportionment in “normal,” “surplus,” and “shortage” years<sup>2</sup>. After the water was apportioned to the Lower Division States, the states, the Decree, and the supplemental Decrees allocated the amounts among the Federal government, Indian tribes, the states themselves, and public and private entities. The right or authorization to beneficially use Colorado River water is defined as an entitlement. Entitlements are created by 1) decree of the United States Supreme Court, 2) through a contract with the Secretary under section 5 of the BCPA, and 3) Federal reservations, including those reserved by the Secretary. It is the entitlement, not the apportionment, that establishes a right to consumptively use Colorado River water.

Those who hold entitlements to Colorado River water are referred to as Contractors. As noted above, Contractors consist of the Federal government, states, Indian tribes, and various public and private entities that are recognized under the Decree, hold a section 5 Contract with the Secretary, or have a Secretarial reservation of water. Contractors can take delivery of Colorado River water by diversion from the river at the various dams and diversion facilities or by pumping water that is drawn from within the accounting surface of the mainstream Colorado River. Contractors have permanent water service (i.e., the Contract, Decreed right or Secretarial reservation of water remains in place indefinitely and is not lost due to non-use). The

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<sup>2</sup> The Secretary is required to determine when “normal,” “surplus,” and “shortage” conditions occur on the LCR. These conditions are determined in the Annual Operating Plan and are referred to as “normal,” “surplus,” and “shortage” years. As generally set forth in the Decree, a “normal year” occurs if there is sufficient mainstream Colorado River water available to satisfy 7.5 maf of annual consumptive use in the Lower Division States; a “surplus year” occurs if there is sufficient mainstream water available for release to satisfy in excess of 7.5 maf of annual consumptive use in the Lower Division States; a “shortage year” occurs if there is insufficient mainstream water available for release to satisfy 7.5 maf of annual consumptive use in the Lower Division States. The Secretary makes an annual determination of the water supply conditions, in consultation with the Basin States, Indian tribes with Federal reserved rights, and other parties.

consumptive use of water by each Contractor is accounted for in the apportionment of the state where the water is used, so that the consumptive use of water by each Contractor within each state does not exceed the state's apportionment. This concept applies regardless of year type (i.e., normal, surplus, or shortage). There are 79 named Contractors in Arizona, 24 in California, and 15 in Nevada.

Colorado River water from the mainstem is anticipated to provide the necessary water supplies for establishing and maintaining the habitat created by the LCR MSCP. Implementation of the LCR MSCP would require the use of water as described below. LCR MSCP parties would obtain Colorado River water to meet these requirements from various sources in accordance with the Law of the River and in coordination with the Lower Basin State(s) whose apportionment may be affected by the use. The legal structure governing the Colorado River would ensure that these uses would not increase the amount of water used in the LCR Basin beyond existing entitlements. The geographic scope of the proposed action (section 2.1.1.2) would ensure that Colorado River water that would be used by the LCR MSCP is used within the historic floodplain and tributaries of the LCR. Sources of water supply other than the Colorado River may become available during the 50-year implementation period of the LCR MSCP. Any water source that would be required to implement the conservation measures would be analyzed during the LCR MSCP site selection process.

#### MAINSTREAM WATER USE ATTRIBUTES ASSOCIATED WITH COTTONWOOD-WILLOW AND HONEY MESQUITE LAND COVER

The potential water use attributes associated with the creation of cottonwood-willow and honey mesquite land cover may include site preparation, establishment irrigation, maintenance irrigation, and managed flooding. Each of these attributes is described below.

*Site Preparation.* After clearing and root-ripping to remove the exotic vegetation, soil conditioning or leaching of salts may be necessary. This work may require several applications of mainstream water to create appropriate soil conditions prior to revegetation with the desired native riparian plant species. Site preparation water use needs are probably not necessary, or very limited, on sites involving the conversion of lands in agricultural crop production to support stands of cottonwood-willow and honey mesquite. Depending upon the existing conditions of the soil column at the proposed habitat creation site, site preparation water use may be necessary for only one growing season.

*Establishment Irrigation.* Water use for establishment irrigation would be necessary to ensure that the recently planted native plant species were maintained and to promote vigorous growth. Typically, on sites with undulating or uneven topography, this could involve the application of mainstream water via sprinkler or drip irrigation systems (recognizing that most of the selected sites should be favorable for flood irrigation practices or would be graded and leveled during site preparation, but that sprinklers could be used under special or local conditions). On lands converted from agricultural crop production, the land may be level enough to facilitate flood irrigation using the existing water conveyance infrastructure. Generally, it is expected that establishment irrigation would be required at specific sites for 1 to 3 years following revegetation until the young tree root systems are able to reach the water table.

1 *Maintenance Irrigation.* Water use for maintenance irrigation may be necessary to maintain  
2 overall plant health and vigor in sites where depth to water is beyond the ability of the plant's  
3 root systems to access. The ability to access water may be more of an issue for cottonwood-  
4 willow and associated shrub and forb understory communities than for mesquite species (i.e.,  
5 mesquite has been shown to exhibit rooting depths in excess of 50 feet [Stromberg, et al. 1992]).  
6 At some sites, it may be desirable or feasible to lower the grade in order to ensure adequate  
7 depths to water for mature riparian plant species, thus limiting maintenance irrigation  
8 requirements. Depending upon specific site characteristics, maintenance irrigation may be  
9 required one or more times annually during the 50-year term of the LCR MSCP, particularly for  
10 the created patches of cottonwood-willow land cover.

11 *Managed Flooding.* Water use for managed flooding is intended to simulate pre-development  
12 hydrologic conditions along the LCR. The concept involves flooding or irrigating the  
13 established patch of riparian vegetation from late February through late March or early April,  
14 during the seed germination period for cottonwood-willow. This technique requires the  
15 presence of a number of mature cottonwood and willow seed source trees in close proximity to  
16 the habitat creation site. This managed flooding promotes recruitment of juvenile cohorts of  
17 cottonwood and willow species and maintains adequate soil conditions. Managed flooding  
18 may be desirable at some sites on an annual basis, while at other sites it may only be necessary  
19 every 2-3 years. Because of the current paucity of seed trees within the planning area, this  
20 technique may be somewhat limited during the first decade of Conservation Plan  
21 implementation until more mature trees are present in areas suitable for habitat creation.

22 Managed flooding may also be required to maintain adequate, or suitable, soil-moisture content  
23 at specific habitat creation sites. Adequate soil moisture promotes healthy macro- and micro-  
24 biotic conditions and the production of flying insects important to many of the covered species  
25 (e.g., southwestern willow flycatcher and bats). This aspect of managed flooding could be  
26 accomplished, in some cases, with the February-April flooding requirements for seed  
27 germination, but may also be required one or more times per month during the heat of the  
28 summer if the soil moisture conditions warrant.

29 A third type of managed flooding involves maintaining saturated soils or standing water in and  
30 adjacent to created stands of cottonwood-willow associated with occupied southwestern willow  
31 flycatcher habitat from May 1 through August 30. This habitat characteristic is highly desirable  
32 to promote successful breeding and recruitment of neotropical migrant bird species.  
33 Consequently, at sites currently occupied by southwestern willow flycatcher, or sites that over  
34 time become territories and nesting sites of this species, it may be necessary to include this  
35 water use, as well. It may be possible to use adjacent marsh or backwater land cover types to  
36 meet this requirement.

37 *Water Use.* Based upon the proposed creation of 5,940 acres of cottonwood-willow and 1,320  
38 acres of honey mesquite land cover types, a preliminary analysis indicates that approximately  
39 34,480 afy of mainstream water would be required to meet the consumptive use by the created  
40 habitat. This amount is based upon an average evapotranspiration (ET) rate of 4.74 afy per acre

for cottonwood-willow land cover and 4.79 afy per acre for the mesquite land cover.<sup>3</sup> Additionally, it has been estimated that an additional 8,600 afy may be required associated with periodic managed flooding events. This is particularly important for the created and maintained stands of cottonwood-willow because these stands must maintain certain specific macrosite and microsite characteristics in order to function as habitat for covered species.

#### MARSH LAND COVER CREATION MAINSTREAM WATER USE ATTRIBUTES

The proposed action includes the creation and maintenance of 512 acres of marsh land cover. The potential water use attributes associated with creation of native marsh may include existing backwater enhancement and/or enlargement and new backwater and marsh creation. Each of these attributes is described below.

*Existing Backwater Enhancement/Enlargement.* To create functional marshes, it may be feasible and desirable to restructure existing backwater features within the planning area. This restructuring may involve the use of amphibious excavators to enlarge and reshape the interface between the backwater and the floodplain. Benches and shelves could be sculpted to create the shallow water conditions necessary to promote establishment and maintenance of marsh vegetation for both the Yuma clapper rail and California black rail. The potential mainstream water use is associated with increased open water surface area and evaporation, as well as additional consumptive use related to the ET by the marsh vegetation.

*New Backwater and Marsh Creation.* In conjunction with the creation of large patches of native riparian vegetation or isolated native fish refugia in the floodplain, it may be feasible and desirable to create functioning patches of marsh at the interface between the backwater and riparian vegetation. The potential mainstream water use is related to open water evaporation and the ET of the marsh vegetation.

*Water Use.* The proposed creation and maintenance of 512 acres of marsh land cover would require an estimated 3,000 afy of mainstream water. This amount is based on an average ET rate of 5.77 af per acre per year. Again, this average ET rate was calculated from data reported in Reclamation's calendar year (CY)-1999 LCRAS annual report for the three mainstream reaches of the Colorado River below Davis Dam.

#### BACKWATER CREATION MAINSTREAM WATER USE ATTRIBUTES

The potential water use attributes associated with creation of the actively managed connected or disconnected backwaters may include enhancement and/or enlargement of existing connected or disconnected backwaters and new backwater and marsh creation. Each of these attributes is described below.

*Enhancement and/or Enlargement of Existing Connected or Disconnected Backwaters.* This habitat creation concept, like marsh habitat creation, involves enhancement or enlargement of existing backwaters and the creation of new backwaters adjacent to the mainstream or in the floodplain.

<sup>3</sup> The average ET rate was calculated utilizing data reported in Reclamation's CY-1990 LCRAS Annual Report; and was based upon ET rates reported for three reaches of the mainstream (i.e., Davis Dam to Parker Dam, Parker Dam to Imperial Dam, and Imperial Dam to the Southerly International Boundary).

Existing backwaters could be modified to provide improved water flow and water quality through the backwater (e.g., culverts, gate structures, percolation dike structures, openings directly to the mainstream). Backwaters could be divided into zones to better facilitate management of native fish and desired aquatic characteristics. The potential mainstream water use associated with enhanced or modified backwater creation activities is related to evaporation and bank storage.

*New Backwater and Marsh Creation.* In conjunction with the creation of large patches of cottonwood-willow, honey mesquite, and marsh land cover types, it may be desirable to construct isolated native fish refugia in the floodplain. These refugia could involve reestablishment of a hydrologic connection in a relict channel feature, remnant backwater, swale, or slough. Typically, this reestablishment involves lowering the grade of the land surface in the relict channel feature or diversion (e.g., via direct diversion from the mainstream and conveyance or supplied by groundwater pumping from wells in the floodplain) and conveyance of a water supply to the feature.

In the integrated mosaic concept, it is likely that functioning patches of marsh would be established around the fringe of the new backwater. The potential mainstream water use is related to open water evaporation, bank storage, and the ET of the associated marsh vegetation.

*Water Use.* The proposed creation and maintenance of 360 acres of backwaters would require an estimated 1,900 afy of mainstream water. This amount is based upon an average ET and evaporation rate of 5.17 af per acre per year. This average evaporation and ET rate was calculated from data reported in Reclamation's CY-1999 LCRAS annual report for the three mainstream reaches of the Colorado River below Davis Dam.

### ESTABLISHMENT AND OPERATION OF NATIVE FISH HATCHERY AND REARING FACILITIES

To produce sufficient numbers of native endangered fishes for reintroduction into suitable LCR mainstream habitats, it is likely that additional native fish production facilities would be required. Some of these hatchery facilities may be constructed off-stream, which is outside of the planning area. No mainstream water use would be associated with these off-stream facilities. At suitable sites within the planning area, it may make economic sense to construct the facility in the adjacent floodplain, thus reducing transport costs and the transit time associated with moving the fish from the facility to the reintroduction site.

Hatchery facilities would involve the construction and maintenance of raceways and grow-out ponds. Mainstream water, either directly pumped from the river or from wells in the floodplain, would provide the water supply for these activities. The potential mainstream water use attributes are generally associated with open water evaporation and bank storage in unlined earthen ponds and/or evaporation from lined ponds or raceways. The amount of water that could be required for hatchery and rearing facilities would be based on the consumptive use through evaporation.

### SUMMARY OF CONSERVATION AREA MAINSTREAM WATER USE AND MANAGEMENT NEEDS

As described above, the potential requirements for the use of mainstream Colorado River water include the following types of activities:

- Conservation area site preparation;
- Establishment and maintenance of riparian, marsh/wetland, and aquatic and backwater land cover to provide habitat for covered species, as well as native fish rearing facilities; and
- Periodic managed flooding to maintain overall plant growth and vigor and promote the development of moist soil conditions and flying insect production.

These potential uses of mainstream water are anticipated to occur over the life of the 50-year LCR MSCP. Generally, the expected mainstream water uses associated with establishment and maintenance of conservation areas could include the use of the annual amounts shown below:

Cottonwood-willow	28,156 af
Honey mesquite	6,323 af
Marsh	2,954 af
Aquatic	1,861 af
Total	39,294 af

To meet the estimated consumptive use (CU) requirement associated with all of the conservation areas, it is assumed that 6.0 afy per acre would be necessary. Consequently, to satisfy the CU requirement of 39,294 afy, approximately 48,800 afy would need to be applied to the conservation areas.

As described above, the periodic managed flooding requirement to maintain overall plant growth and vigor and promote the development of moist soil conditions and flying insect production is estimated to be approximately 8,600 afy of additional mainstream water. This water is assumed to be an additional 25 percent of the annual CU of that required to meet the conservation area site total CU needs for cottonwood-willow and mesquite land cover types.

In summary, the total estimated conservation area CU needs, including the managed flooding requirements, is approximately 39,300 afy. This total results in an estimated requirement of approximately 57,400 afy to establish and maintain the 8,132 acres of LCR MSCP conservation areas.

### **2.1.1.5 General Species Conservation Measures**

#### *Avoidance and Minimization Measures*

This section describes the conservation measures that would be implemented to avoid and minimize the effects of implementing the proposed action. In addition to these conservation measures, the best management practices (BMPs) of the state in which a covered activity is implemented would be used to control sedimentation in the vicinity of water bodies during ground-disturbing activities.

**Avoidance and minimization measure (AMM)1—To the extent practicable, avoid and minimize impacts of implementing the Conservation Plan on existing covered species habitats.** To the extent practicable, establishment and management of created habitats would avoid removal of existing cottonwood-willow stands, honey mesquite bosques, marsh, and backwaters to avoid and minimize impacts on habitat they provide for covered species.

Temporary disturbance of covered species habitats, however, may be associated with habitat establishment and subsequent maintenance activities (e.g., controlled burning in marshes and removal of trees to maintain succession objectives). Conservation Plan measures that could result in such temporary disturbances would, to the extent practicable, be designed and implemented to avoid or minimize the potential for disturbance. In addition to implementing AMM3 and AMM4 below, these measures could include conducting pre-construction surveys to determine if covered species are present and, if present, implementing habitat establishment and management activities during periods the species would be least sensitive to the activities, or redesigning the activities to avoid the need to disturb sensitive habitat use areas; staging construction actions away from sensitive habitat use areas; and implementing BMPs to control erosion when implementing ground-disturbing activities.

**AMM2—Avoid impacts of flow-related covered activities on covered species habitats at Topock Marsh.** Impacts on groundwater levels that support covered species habitat at Topock Marsh would be avoided by maintaining water deliveries for maintenance of water levels and existing conditions. At times, flow-related activities could lower river elevations to levels that could disrupt diversion of water from the river to the marsh. Improvements to intake structures that allow water to continue to be diverted or other measures to maintain the water surface elevation would avoid effects on groundwater elevation. Avoidance of effects could be accomplished with the purchase, installation, and operation of two electric pumps sized to the current inflow at the Topock Marsh diversion inlet. The pumps would most likely need to be operated during summer to make up for the lower flow periods.

Implementation of this conservation measure would maintain existing habitat at Topock Marsh for the Yuma clapper rail, southwestern willow flycatcher, Colorado River cotton rat, western least bittern, California black rail, yellow-billed cuckoo, gilded flicker, vermilion flycatcher, Arizona Bell's vireo, and Sonoran yellow warbler. Maintaining water deliveries to Topock Marsh would also maintain razorback sucker and bonytail habitat associated with disconnected backwaters managed for these species.

**AMM3—Avoid disturbance of covered bird species during the breeding season.** To the extent practicable, to avoid and minimize potential impacts on covered bird species, vegetation management activities (e.g., periodic removal of emergent vegetation to maintain canals and drains) associated with implementation of covered activities and the Conservation Plan that could result in disturbance to covered bird species would not be implemented during the breeding season to prevent injury or mortality of eggs and young birds unable to avoid these activities.

**AMM4—Minimize contaminant loads in runoff and return irrigation flows from LCR MSCP-created habitats to the LCR.** LCR MSCP-created habitats that require irrigation to establish and maintain vegetation to provide habitat would be designed and managed to minimize contaminant loads that could return to the LCR as runoff or return-flow. Measures would include vegetation establishment methods that minimize the need for application of herbicides, pesticides, and fertilizers and designing irrigation methods and new irrigation infrastructure to reduce runoff and return-flows to the extent practicable. Use of pesticides is not a covered activity. Pesticides used to establish and maintain Conservation Plan habitats



would be applied in accordance with EPA restrictions and, as needed, authorization for their use would be sought under separate permits.

**AMM5—Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the planning area.** To the extent practicable, before implementing activities associated with operation, maintenance, and replacement of hydroelectric generation and transmission facilities, measures would be identified and implemented that are necessary to avoid take of covered species where such activities could otherwise result in take. These measures could include conducting surveys to determine if covered species are present and, if so, deferring the implementation of activities to avoid disturbance during the breeding season; redesigning the activities to avoid the need to disturb covered species habitat use areas; staging equipment outside of covered species habitats; delineating the limits of vegetation control activities to ensure that only the vegetation that needs to be removed to maintain infrastructure is removed; stockpiling and disposing of removed vegetation in a manner that minimizes the risk of fire; and implementing BMPs to control erosion when implementing ground-disturbing activities.

**AMM6—Avoid or minimize impacts on covered species habitats during dredging, bank stabilization activities, and other river management actions.** To the extent practicable, before initiating activities involved with river maintenance projects, measures would be identified and implemented that avoid or minimize take of covered species where such activities could otherwise result in take. Such measures could include alternative methods to achieve project goals, timing of activities, pre-activity surveys, and minimizing the area of effect, including offsite direct and indirect effects (e.g., avoiding or minimizing the need to place dredge spoil and discharge lines in covered species habitats; placing dredge spoils in a manner that would not affect covered species habitats).

#### *Monitoring and Research Measures*

This section describes the monitoring and research measures that would be implemented to help guide the design and management of established habitats over the term of the Conservation Plan.

**Monitoring and research measure (MRM)1—Conduct surveys and research to better identify covered and evaluation species habitat requirements.** Conduct surveys and research, as appropriate, to collect information necessary to better define the species habitat requirements and to design and manage fully functioning established covered and evaluation species habitats. This conservation measure applies to the following species<sup>4</sup>:

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<sup>4</sup> MRM1 and MRM2 apply to those species for which comparable measures are not subsumed under species-specific conservation measures. They are not applicable to species for which habitat would not be established under the Conservation Plan, such as the desert tortoise, relict leopard frog, humpback chub, and threecorner milkvetch.

Yuma clapper rail	California black rail	Arizona Bell's vireo
Southwestern willow flycatcher	Yellow-billed cuckoo	Sonoran yellow warbler
Western red bat	Elf owl	Summer tanager
Western yellow bat	Gilded flicker	California leaf-nosed bat
Desert pocket mouse	Gila woodpecker	Pale Townsend's big-eared bat
Western least bittern	Vermilion flycatcher	

**MRM2—Monitor and adaptively manage created habitats for covered species and evaluation species.** Created species habitats would be managed to maintain their functions as species habitat over the term of the LCR MSCP. Created habitat would be monitored and adaptively managed over time to determine the types and frequency of management actions that may be required to maintain created cottonwood-willow, honey mesquite, marsh, and backwater land cover as habitat for covered species. This conservation measure applies to the following species:

Yuma clapper rail	Western least bittern	Arizona Bell's vireo
Southwestern willow flycatcher	California black rail	Sonoran yellow warbler
Western red bat	Yellow-billed cuckoo	Summer tanager
Western yellow bat	Elf owl	Flannelmouth sucker
Desert pocket mouse	Gilded flicker	MacNeill's sootywing skipper
Colorado River cotton rat	Gila woodpecker	California leaf-nosed bat
Yuma hispid cotton rat	Vermilion flycatcher	Pale Townsend's big-eared bat

**MRM3—Conduct research to determine and address the effects of nest site competition with European starlings on reproduction of covered species.** Research would be undertaken to determine whether nest site competition with European starlings is a substantial factor limiting the reproductive success of the elf owl, gilded flicker, and Gila woodpecker. If so, experimental programs may be implemented to determine the effectiveness and practicality of controlling starlings.

**MRM4—Conduct research to determine and address the effects of brown-headed cowbird nest parasitism on reproduction of covered species.** Research would be undertaken to determine whether brown-headed cowbird nest parasitism is a substantial factor limiting the reproductive success of the southwestern willow flycatcher, vermilion flycatcher, Arizona Bell's vireo, Sonoran yellow warbler, and summer tanager in the planning area. If so, studies would be implemented to identify effective and practical methods for controlling brown-headed cowbirds. If cowbirds are adversely affecting breeding success and effective control measures are developed, a program would be implemented to monitor the effects of cowbirds on nesting success in created habitats to determine the need for cowbird control and to implement cowbird control measures in locations where cowbird control is needed to improve reproductive success.

**MRM5—Monitor selenium levels in created backwater and marsh land cover types, and study the effect of selenium released as a result of dredging activities.** Conduct monitoring of selenium levels in sediment, water, and/or biota present in LCR MSCP created backwater and marsh land cover types. If monitoring results indicate that management of the LCR MSCP conservation areas increases levels of selenium in created backwaters and marshes or in covered species that use them, the LCR MSCP would undertake research to develop feasible methods to

1 manage the conservation areas in a manner that would eliminate or compensate for the effects  
2 of increased selenium levels. If feasible management methods were identified, they would be  
3 implemented. This conservation measure would include monitoring the effects of dredging  
4 and dredge spoil disposal associated with creating and maintaining backwaters and marshes. If  
5 monitoring results indicate that current or future dredging and dredge spoil disposal methods  
6 increase selenium levels, the LCR MSCP would only implement methods that will have the  
7 least effect on selenium levels. A study would also be conducted to look at the effects of  
8 potential releases of selenium from dredging in general.

#### 9 *Conservation Area Management Measures*

10 This section describes the conservation area management measures that would be implemented  
11 to maintain the intended functions and values of created covered species habitats over the term  
12 of the Conservation Plan.

13 **Conservation area management measure (CMM)1 – Reduce risk of loss of established habitat**  
14 **to wildfire.** Management of conservation areas would include contributing to and integrating  
15 with local, state, and Federal agency fire management plans. Conservation areas would be  
16 designed to contain wildfire and facilitate rapid response to suppress fires (e.g., fire  
17 management plans would be an element of each conservation area management plan).

18 **CMM2—Replace created habitat affected by wildfire.** In the event of established habitat  
19 degradation or loss as a result of wildfire, land management and habitat establishment  
20 measures to support the reestablishment of native vegetation would be identified and  
21 implemented.

#### 22 *Species-Specific Conservation Measures for Covered Species*

23 This section describes the species-specific conservation measures, in addition to the general  
24 conservation measures described above under “Avoidance and Minimization Conservation  
25 Measures” that would be implemented to avoid, minimize, and fully mitigate the effects of  
26 implementing covered activities and contribute to the recovery of listed covered species/reduce  
27 the likelihood of future listing of unlisted covered species.

#### 28 *YUMA CLAPPER RAIL*

29 **CLRA1—Create 512 acres of Yuma clapper rail habitat.** Create and manage 512 acres of marsh  
30 to provide Yuma clapper rail habitat. This created habitat would also provide habitat for the  
31 western least bittern and the California black rail (see conservation measures LEBI1 and  
32 BLRA1). Habitat would be created in patches as large as possible but would not be created in  
33 patches smaller than 5 acres.

34 **CLRA2—Maintain existing important Yuma clapper rail habitat areas.** The LCR MSCP  
35 participants, under agreements with cooperating land management agencies, would provide  
36 funding to those agencies to maintain a portion of existing Yuma clapper rail habitat within the  
37 planning area.

### SOUTHWESTERN WILLOW FLYCATCHER

**WIFL1—Create 4,050 acres of southwestern willow flycatcher habitat.** Of the 5,940 acres of created cottonwood-willow, at least 4,050 acres would be designed and created to provide habitat for this species. Created cottonwood-willow would be designed and managed to support cottonwood-willow types I–IV that provide breeding habitat for this species.

**WIFL2—Maintain existing important habitat areas.** The LCR MSCP participants, under agreements with cooperating land management agencies, would provide funding to those agencies to maintain a portion of existing southwestern willow flycatcher habitat within the planning area.

### DESERT TORTOISE

**DETO1—Acquire and protect 230 acres of existing unprotected occupied habitat.** The acquired habitat would be transferred to an appropriate management agency for permanent protection of species' habitat.

**DETO2—Avoid impacts on individuals and their burrows.** The following measures would be implemented to avoid and minimize impacts on desert tortoise:

- Before implementing non-flow-related covered activities and LCR MSCP conservation measures in desert tortoise habitat, presence or absence surveys would be conducted using approved Service survey protocols to locate desert tortoises and their burrows (USFWS 1992). The number and location of all tortoises or tortoise signs (e.g., shells, bones, scutes, limbs, scats, burrows, pellets, tracks, egg shell fragments, courtship rings, drinking sites, and mineral licks) that occur within the project area and its zone of influence and whether any tortoises occur outside of the project area whose home ranges may overlap the project area or its zone of influence should be identified. The project area is defined as any area that would be cleared or partially cleared; have vehicles on or adjacent to it; be temporarily or permanently used for equipment or materials storage, loading, or unloading; or would have its soil or vegetation damaged, fragmented, or disturbed. Desert tortoise presence or absence surveys should be conducted during the typical period of activity for the tortoise (i.e., March 25 to May 31). Surveys should be conducted during daylight hours. The Service considers the results of a presence or absence survey, including the zone of influence, to be valid for no more than 1 year, although the time period may be significantly reduced, depending on project size, location, or proximity to other land disturbance.
- If desert tortoises are present, the covered activity or LCR MSCP activity would be modified to avoid take of individuals and their burrows. However, if impacts cannot be avoided, clearance surveys would be conducted to locate desert tortoises that would be removed and relocated to other habitat areas. Clearance surveys should be conducted to locate all desert tortoises above and below ground within the project area that would be temporarily relocated or salvaged using the Service clearance survey protocol (USFWS 1992). Clearance surveys should be conducted immediately prior to surface disturbance at each site within the project area. Surveys should be conducted during daylight hours.

- If impacts cannot be avoided, desert tortoises should be removed and relocated to other habitat areas, if appropriate. The Desert Tortoise Council guidelines for determining whether tortoises should be moved, mapping tortoise burrows, determining whether burrows should be excavated, finding tortoises in burrows, excavating burrows, constructing artificial burrows, handling tortoise eggs, handling tortoises, processing tortoises, translocating tortoises, and releasing tortoises should be followed (Desert Tortoise Council 1994).

## BONYTAIL

**BONY1—Coordinate bonytail conservation efforts with the Service and recovery programs for endangered fish species in the Lower Basin..** The LCR MSCP would interact with the Service or any formal recovery program developed in the future for the Lower Basin to ensure that conservation measures included in the Conservation Plan would be implemented in support of recovery efforts to meet recovery goals for the bonytail in the Lower Basin. The LCR MSCP may also use funding programmed for bonytail augmentation (BONY3) and other bonytail conservation measures to implement other recovery activities identified by the Service or a future formal recovery program if it is determined through the adaptive management process and with concurrence of the Service that providing such funding would more effectively contribute to recovery of the bonytail.

**BONY2—Create 360 acres of bonytail habitat.** Create 360 acres of backwater with depth, vegetation, and substrate characteristics that provide the elements of bonytail habitat. This created backwater would also provide habitat for the razorback sucker. Created backwaters would be designed and managed as described in section 2.1.1.3, Conservation Concepts. At a minimum, created backwaters would contain the physical, chemical, and biological conditions suitable for the establishment and maintenance of healthy fish populations in the LCR.

**BONY3—Bonytail augmentation program.** The LCR MSCP would provide a level of funding to support implementation of a stocking/augmentation program for the bonytail providing for the stocking of up to 620,000 subadult bonytail (at least 300 mm [~ 12 inches] in length) into the designated critical habitat for the species in Reaches 2-3, and in Reaches 4 and 5 of the LCR. The figure of 620,000 fish is not a target number for the LCR but represents an assumption (see BONY1) used to define the extent of funding that would be available, with the understanding that the adaptive management process would guide the actual stocking program.

**BONY4—Evaluate and develop, if necessary, additional bonytail rearing capacity.** Additional rearing capacity, if needed, would be developed through cooperation between AGFD, CDFG, NDOW, the Service, and other LCR MSCP participants, or fish may be acquired from other sources.

**BONY5—Conduct monitoring and research, and adaptively manage bonytail augmentations and created habitat.** Monitoring and research would be conducted to gather information necessary to adaptively manage bonytail conservation, including aggressive monitoring of fish response following augmentations to gather information regarding habitat use and fish movement, to increase the success of subsequent management of the species.

### 1 HUMPBACK CHUB

2 **HUCH1—Provide funding to support existing humpback chub conservation programs.** The  
3 LCR MSCP would provide \$10,000 per year for 50 years (\$500,000 total) to the Glen Canyon  
4 Dam Adaptive Management Program or other entity approved by the Service to support  
5 implementation of planned, but unfunded, species conservation measures and, as appropriate,  
6 to fund species conservation measures in the lower Grand Canyon of the Colorado River  
7 upstream of Lake Mead NRA.

### 8 RAZORBACK SUCKER

9 **RASU1—Coordinate razorback sucker conservation efforts with the Service and recovery**  
10 **programs for endangered fish species in the Lower Basin.** The LCR MSCP would interact  
11 with the Service or any formal recovery program developed in the future for the Lower Basin to  
12 ensure that conservation measures included in the Conservation Plan would be implemented in  
13 support of recovery efforts to meet recovery goals for the razorback sucker in the Lower Basin.  
14 The LCR MSCP may also use funding programmed for razorback sucker augmentation  
15 (RASU3) and other razorback sucker conservation measures to implement other recovery  
16 activities identified by the Service or a future formal recovery program if it is determined  
17 through the adaptive management process and with concurrence of the Service that providing  
18 such funding would more effectively contribute to recovery of the razorback sucker.

19 **RASU2—Create 360 acres of razorback sucker habitat.** Create 360 acres of backwater with  
20 water depth, vegetation, and substrate characteristics that provide the elements of razorback  
21 sucker habitat. This created backwater would also provide habitat for the bonytail. Created  
22 backwaters would be designed and managed as described in section 2.1.1.3, Conservation  
23 Concepts. At a minimum, created backwaters would contain the physical, chemical, and  
24 biological conditions suitable for the establishment and maintenance of healthy fish populations  
25 in the LCR.

26 **RASU3—Razorback sucker augmentation program.** The LCR MSCP would provide a level of  
27 funding to support implementation of a stocking/augmentation program for the razorback  
28 sucker, providing for the stocking of up to 660,000 subadult razorback suckers (at least 300 mm  
29 [~12 inches] in length) into the designated critical habitat for the species in Reach 3, and in  
30 Reaches 4 and 5 of the LCR.

31 **RASU4—Develop additional razorback sucker rearing capacity.** The LCR MSCP participants,  
32 in cooperation with AGFD, CDFG, NDOW, and the Service, would develop additional  
33 razorback sucker rearing capacity or would acquire the necessary numbers of fish from other  
34 sources.

35 **RASU5—Support ongoing razorback conservation efforts at Lake Mohave.** Provide support  
36 to maintain the current Lake Mohave Program (Native Fish Work Group) goal of maintaining a  
37 population of 50,000 adult razorback sucker in Lake Mohave as a genetic refuge.

38 **RASU6—Conduct monitoring and research, and adaptively manage razorback sucker**  
39 **augmentations and created habitat.** Monitoring and research would be conducted to gather  
40 information necessary to adaptively manage razorback sucker conservation, including

1 continued monitoring of fish response to previous augmentations, aggressive monitoring of fish  
2 response following LCR MSCP augmentations to gather information regarding habitat use, and  
3 fish movement, to increase the success of subsequent management of the species.

4 **RASU7—Provide funding and support for continuation of the Reclamation/Southern Nevada**  
5 **Water Authority (SNWA) ongoing Lake Mead razorback sucker studies.** The LCR MSCP  
6 would continue to fund and support the ongoing studies of razorback suckers in Lake Mead  
7 that were implemented under the ISC/SIA BO.

8 **RASU8—Continue razorback conservation measures identified in the ISC/SIA BO.**  
9 Reclamation would continue to implement, as part of the LCR MSCP, certain conservation  
10 measures specific to razorback identified in the ISC/SIA BO.

11 WESTERN RED BAT

12 **WRBA1—Conduct surveys to determine the distribution of the western red bat.** Conduct  
13 investigations to identify the distribution of the western red bat in Reaches 3–5.

14 **WRBA2— Create 765 acres of western red bat roosting habitat.** Of the 7,260 acres of  
15 cottonwood-willow and honey mesquite to be created as covered species habitat, at least 765  
16 acres would be designed and created to provide western red bat roosting habitat.

17 WESTERN YELLOW BAT

18 **WYBA1—Conduct surveys to determine the distribution of the western yellow bat.** Conduct  
19 investigations to identify the distribution of the western yellow bat in Reaches 3–5.

20 **WYBA2—Avoid removal of western yellow bat roost trees.** To the extent practicable, avoid  
21 removal of palm trees that could serve as roosts for the western yellow bat when establishing  
22 covered species habitats.

23 **WYBA3—Create 765 acres of western yellow bat roosting habitat.** Of the 7,260 acres of  
24 cottonwood-willow and honey mesquite to be created as covered species habitat, at least 765  
25 acres would be designed and created to provide western yellow bat roosting habitat.

26 DESERT POCKET MOUSE

27 **DPMO1—Conduct surveys to locate desert pocket mouse habitat.** Conduct surveys to locate  
28 desert pocket mouse habitat that could be affected by habitat creation-related activities to  
29 determine whether the habitat is occupied. If the habitat is occupied, design habitat creation-  
30 related activities to avoid the habitat. If the habitat cannot be avoided, to the extent practicable,  
31 restore the disturbed habitat area onsite following completion of the activities and protect and  
32 incorporate the habitat into the conservation area. If the habitat cannot be restored onsite,  
33 establish amount of habitat at least equal to the extent of disturbed habitat elsewhere in the  
34 conservation area.

### 1 COLORADO RIVER COTTON RAT

#### 2 **CRCR1—Conduct research to better define Colorado River cotton rat habitat requirements.**

3 Conduct research, if needed, to better define the elements of Colorado River cotton rat habitat  
4 and provide information necessary to design and manage established habitat.

5 **CRCR2—Create 125 acres of Colorado River cotton rat habitat.** Of the 512 acres of marsh to be  
6 created to create Yuma clapper rail habitat, at least 125 acres would be designed to also provide  
7 Colorado River cotton rat habitat in Reaches 3 and 4 near occupied habitat.

### 8 YUMA HISPID COTTON RAT

#### 9 **YHCR1—Conduct research to better define Yuma hispid cotton rat habitat requirements.**

10 Conduct research, if needed, to better define the elements of Yuma hispid cotton rat habitat and  
11 provide information necessary to design and manage established habitat.

12 **YHCR2—Create 76 acres of Yuma hispid cotton rat habitat.** Of the 5,940 acres of cottonwood-  
13 willow to be created as habitat for covered species, at least 76 acres would be designed to  
14 provide habitat for the Yuma hispid cotton rat in Reaches 6 and 7 near occupied habitat.

### 15 WESTERN LEAST BITTERN

16 **LEBI1—Create 512 acres of western least bittern habitat.** Create and manage 512 acres of  
17 marsh to provide western least bittern habitat. This created habitat would also be habitat for  
18 the Yuma clapper rail (conservation measure CLRA1).

### 19 CALIFORNIA BLACK RAIL

20 **BLRA1—Create 130 acres of California black rail habitat.** Of the 512 acres of LCR MSCP-  
21 created marsh, 130 acres would be created and managed to provide California black rail habitat  
22 near occupied habitat in Reaches 5 and 6.

23 **BLRA2—Maintain existing important California black rail habitat areas.** The LCR MSCP  
24 participants, under agreements with cooperating land management agencies, would provide  
25 funding to those agencies to maintain a portion of existing California black rail habitat in the  
26 planning area.

### 27 YELLOW-BILLED CUCKOO

28 **YBCU1—Create 4,050 acres of yellow-billed cuckoo habitat.** Of the 5,940 acres of created  
29 cottonwood-willow, at least 4,050 acres would be designed and created to provide habitat for  
30 this species.

31 **YBCU2—Maintain existing important yellow-billed cuckoo habitat areas.** The LCR MSCP  
32 participants, under agreements with cooperating land management agencies, would provide  
33 funding to those agencies to maintain a portion of existing yellow-billed cuckoo habitat within  
34 the planning area.



## 1 ELF OWL

2 **ELOW1—Create 1,784 acres of elf owl habitat.** Of the 7,260 acres of created cottonwood-  
3 willow and honey mesquite land cover, at least 1,784 acres would be designed and created to  
4 provide elf owl habitat.

5 **ELOW2—Install elf owl nest boxes.** Until vegetation has matured sufficiently to attract  
6 woodpeckers that are needed to create nesting cavities for the elf owl, structural characteristics  
7 of nesting habitat (i.e., snags) would be artificially established.

## 8 GILDED FLICKER

9 **GIFL1—Create 4,050 acres of gilded flicker habitat.** Of the 5,940 acres of created cottonwood-  
10 willow, at least 4,050 acres would be designed and created to provide habitat for this species.

11 **GIFL2—Install artificial snags to provide gilded flicker nest sites.** Until vegetation in  
12 established patches of gilded flicker habitat has matured sufficiently to support structural  
13 characteristics of nesting habitat (i.e., snags), install artificial snags that can be used by gilded  
14 flickers to excavate nesting cavities.

## 15 GILA WOODPECKER

16 **GIWO1—Create 1,702 acres of Gila woodpecker habitat.** Of the 5,940 acres of created  
17 cottonwood-willow, at least 1,702 acres would be designed and created to provide habitat for  
18 this species in Reaches 3-6.

19 **GIWO2—Install artificial snags to provide Gila woodpecker nest sites.** Until vegetation in  
20 established patches of Gila woodpecker habitat has matured sufficiently to support structural  
21 characteristics of nesting habitat (i.e., snags), install artificial snags that can be used by Gila  
22 woodpeckers to excavate nesting cavities.

## 23 VERMILION FLYCATCHER

24 **VEFL1—Create 5,208 acres of vermilion flycatcher habitat.** Of the 7,260 acres of created  
25 cottonwood-willow and honey mesquite, at least 5,208 acres would be designed and created to  
26 provide habitat for this species.

## 27 ARIZONA BELL'S VIREO

28 **BEVI1—Create 2,983 acres of Arizona Bell's vireo habitat.** Of the 7,260 acres of created  
29 cottonwood-willow and honey mesquite, at least 2,983 acres would be designed and created to  
30 provide habitat for this species.

## 31 SONORAN YELLOW WARBLER

32 **YWAR1—Create 4,050 acres of Sonoran yellow warbler habitat.** Of the 5,940 acres of created  
33 cottonwood-willow, at least 4,050 acres would be designed and created to provide habitat for  
34 this species.

### SUMMER TANAGER

**SUTA1—Create 602 acres of summer tanager habitat.** Of the 5,940 acres of created cottonwood-willow, at least 602 acres would be designed and created to provide habitat for the species.

### FLAT-TAILED HORNED LIZARD

**FTHL1—Acquire and protect 230 acres of existing unprotected occupied flat-tailed horned lizard habitat.** The acquired habitat would be transferred to an appropriate management agency for permanent protection of habitat for the species.

**FTHL2—Implement conservation measures to avoid or minimize take of flat-tailed horned lizard.** Reclamation would continue to implement measures to avoid or minimize take of flat-tailed horned lizard. These measures would include worker education programs and other procedures as described in the 1997 BO (USFWS 1997) and are in accordance with the 2003 Flat-tailed Horned Lizard Interagency Coordinating Committee recommendations for the species.

### RELICT LEOPARD FROG

**RLFR1—Provide funding to support existing relict leopard frog conservation programs.** LCR MSCP program activities would assist and contribute to existing relict leopard frog research and conservation programs where appropriate. To the extent consistent with the LCR MSCP Conservation Plan goals and objectives, implementation of this conservation measure would be coordinated with the Relict Leopard Frog Conservation Team.

### FLANNELMOUTH SUCKER

**FLSU1—Create 85 acres of flannemouth sucker habitat.** Of the 360 acres of LCR MSCP-created backwaters, at least 85 acres would be created in Reach 3 with water depth, vegetation, and substrate characteristics that provide the elements of flannemouth sucker habitat.

**FLSU2—Provide funding to support existing flannemouth sucker conservation programs.** The LCR MSCP would provide \$80,000 per year for 5 years (\$400,000 total) to support flannemouth sucker research efforts in Reach 3 below Davis Dam to determine habitat use, habitat preferences, and recruitment and to support decisions on habitat management activities for river channel and backwater habitats in Reach 3.

**FLSU3—Assess flannemouth sucker management needs and develop management strategies.** The LCR MSCP would use results of research conducted by the LCR MSCP (see conservation measure FLSU2) and others, through the adaptive management process, to assess main channel and backwater management needs and develop management strategies to benefit the flannemouth sucker.

### MACNEILL'S SOOTYWING SKIPPER

**MNSW1—Conduct surveys and research to locate MacNeill's sootywing skipper habitat and to better define its habitat requirements.** Conduct research to locate MacNeill's sootywing skipper populations that could be affected by covered activities and determine the macrohabitat

and microhabitat requirements and ecology of the species. Based on research results, implement adaptive management experiments to develop habitat establishment and management methods.

**MNSW2—Create at least 222 acres of MacNeill’s sootywing skipper habitat.** Based on results of research conducted under conservation measure MNSW1, at least 222 acres of MacNeill’s sootywing skipper habitat would be created in Reaches 1–4 near occupied habitat.

STICKY BUCKWHEAT

**STBU1—Provide funding to support existing sticky buckwheat conservation programs.** The LCR MSCP would provide \$10,000 per year until 2030 to the Clark County Multi-Species Habitat Conservation Plan (MSHCP) Rare Plant Workgroup to support implementation of conservation measures for the sticky buckwheat and threecorner milkvetch that are beyond the permit requirements of the Clark County MSCHP.

THREECORNER MILKVETCH

**THMI1—Provide funding to support existing threecorner milkvetch conservation programs.** The LCR MSCP would provide \$10,000 per year until 2030 to the Clark County MSHCP Rare Plant Workgroup to support implementation of conservation measures for the threecorner milkvetch and sticky buckwheat that are beyond the permit requirements of the Clark County MSCHP.

#### *Species-Specific Conservation Measures for Evaluation Species*

Species-specific conservation measures for evaluation species are as follows:

CALIFORNIA LEAF-NOSED BAT

**CLNB1—Conduct surveys to locate California leaf-nosed bat roost sites.** Conduct investigations to identify locations of California leaf-nosed bat roost sites within 5 miles of the planning area in Reaches 3–5.

**CLNB2—Create covered species habitat near California leaf-nosed bat roost sites.** The LCR MSCP process for selecting sites to establish cottonwood-willow and honey mesquite as habitat for other covered species would, based on the information collected under conservation measure CLNB1, give priority, when consistent with achieving LCR MSCP goals for other covered species, to selecting sites that are within 5 miles of California leaf-nosed bat roosts in Reaches 3–5.

PALE TOWNSEND’S BIG-EARED BAT

**PTBB1—Conduct surveys to locate pale Townsend’s big-eared bat roost sites.** Conduct investigations to identify locations of pale Townsend’s big-eared bat roost sites within 10 miles of the planning area in Reaches 3–5.

**PTBB2—Create covered species habitat near pale Townsend’s big-eared bat roost sites.** The LCR MSCP process for selecting sites to establish cottonwood-willow and honey mesquite as

habitat for other covered species would, based on the information collected under conservation measure PTBB1, give priority, when consistent with achieving LCR MSCP goals for other covered species, to selecting sites that are within 10 miles of pale Townsend's big-eared bat roosts in Reaches 3-5.

### COLORADO RIVER TOAD

**CRT01—Conduct research to better define the distribution, habitat requirements, and factors that are limiting the distribution of the Colorado River toad.** Develop and implement a multiyear integrated research program to determine the range, status, habitat requirements, population biology, factors that currently limit Colorado River toad abundance and distribution, and factors that have contributed to the decline of the species in the planning area.

**CRT02—Protect existing unprotected occupied Colorado River toad habitat.** Based on results of research conducted under conservation measures CRT01 and within funding constraints of the LCR MSCP, protect existing unprotected occupied Colorado River toad habitat that is located through the research program.

**CRT03—Conduct research to determine feasibility of establishing the Colorado River toad in unoccupied habitat.** Conduct research necessary to determine the feasibility for successfully establishing the Colorado River toad in unoccupied habitat. If feasible, implement a pilot introduction into unoccupied habitat, and monitor the success of methods and establishment of the Colorado River toad in unoccupied habitat.

### LOWLAND LEOPARD FROG

**LLFR1—Conduct research to better define the distribution, habitat requirements, and factors that are limiting the distribution of the lowland leopard frog.** Develop and implement a multiyear integrated research program to determine the range, status, habitat requirements, population biology, factors that currently limit lowland leopard frog abundance and distribution, and factors that have contributed to the decline of the species in the planning area.

**LLFR2—Protect existing unprotected occupied lowland leopard frog habitat.** Based on results of research conducted under conservation measures LLFRO1 and within funding constraints of the LCR MSCP, protect existing unprotected occupied lowland leopard frog habitat that is located through the research program.

**LLFR3—Conduct research to determine feasibility of establishing the lowland leopard frog in unoccupied habitat.** Conduct research necessary to determine the feasibility for successfully establishing the lowland leopard frog in unoccupied habitat. If feasible, implement a pilot introduction into unoccupied habitat, and monitor the success of methods and establishment of the lowland leopard frog in unoccupied habitat.

#### 2.1.1.6 *Timing of the Implementation of Conservation Measures*

The conservation measures would be implemented as quickly as efficient staffing, funding, and the time required to conduct necessary research relative to creating covered species habitats and required to evaluate and acquire lands that are suitable for creating covered species habitat

would permit. It is not certain when future flow-related activities (i.e., changes in points of diversion) will be implemented or whether all of these activities will be implemented. It is anticipated, however, that changes in points of diversion will not be implemented for several years following approval of the Conservation Plan. Because of the uncertainties surrounding species requirements, habitat creation techniques, and the capabilities of potential habitat creation sites to provide habitat, the LCR MSCP anticipates that the first few years of Conservation Plan implementation would focus on conducting research and adaptive management experiments (e.g., pilot habitat creation projects to test habitat creation techniques) to collect information necessary to successfully implement the LCR MSCP. Following collection of this information, implementation of the LCR MSCP is expected to rapidly accelerate, with most or all of the habitat creation conservation component of the LCR MSCP completed within 20–30 years of LCR MSCP HCP approval.

The anticipated implementation strategy for establishing cottonwood-willow, honey mesquite, and marsh land cover types to create habitats for cottonwood-willow-associated covered species builds on information that would be gathered in the first few years of Conservation Plan implementation. It is presumed that during implementation Years 0–5, most habitat creation projects would be small in scale and designed to identify and verify the most cost effective means of creating high quality habitat. Larger scale projects would be implemented in Years 6–10 that are designed based on information gathered from previous plantings and partnerships with willing landowners. Implementation Years 11–30 would focus on large-scale habitat creation projects until the habitat creation objective acreage is achieved. The strategy for creation of both connected and disconnected backwaters assumes 60 acres of backwater would be created during each 5-year implementation period, with a goal of creating several small or one or two larger backwaters during any single year. Performance criteria for covered species habitats would be used to determine the extent of established cottonwood-willow, honey mesquite, and marsh that develops as habitat for covered species.

Tables 2.1-8a-d describe the proposed implementation rate and interim acreage goals for establishment of created habitats.

**Table 2.1-8a. Anticipated Schedule for Establishment of Cottonwood/Willow**

<i>Years</i>	<i>Acres/Year</i>	<i>5-Year Total</i>	<i>Cumulative Total</i>
1–5	50	250	250
6–10	150	750	1,000
11–15	300	1,500	2,500
16–20	300	1,500	4,000
21–25	300	1,500	5,500
26–30	–	440	5,940

**Table 2.1-8b. Anticipated Schedule for Establishment of Honey Mesquite**

<i>Years</i>	<i>Acres/Year</i>	<i>5-Year Total</i>	<i>Cumulative Total</i>
1-5	20	100	100
6-10	40	200	300
11-15	80	400	700
16-20	80	400	1,100
21-25	-	220	1,320
26-30	-	-	1,320

**Table 2.1-8c. Anticipated Schedule for Establishment of Marsh**

<i>Years</i>	<i>Acres/Year</i>	<i>5-Year Total</i>	<i>Cumulative Total</i>
1-5	10	50	50
6-10	20	100	150
11-15	40	200	350
16-20	40	162	512
21-25	-	-	-
26-30	-	-	-

**Table 2.1-8d. Anticipated Schedule for Establishment of Backwaters**

<i>Years</i>	<i>Acres/Year</i>	<i>4-Year Total</i>	<i>Cumulative Total</i>
1-5	15	60	60
6-10	15	60	120
11-15	15	60	180
16-20	15	60	240
21-25	15	60	300
26-30	15	60	360

### 2.1.1.7 Monitoring and Research

The elements of the monitoring and research program include system monitoring, species monitoring and research, habitat creation technology research, and post-development or post-habitat creation monitoring.

The LCR MSCP Program Manager, in cooperation with the Service, would direct development and implementation of the monitoring and research program. The LCR MSCP would maintain databases for storage and retrieval of monitoring and research data collected under the LCR MSCP and by others that are relevant to covered species and their habitats, as well as for tracking implementation and success of Conservation Plan measures. Monitoring and research would primarily be directed to fill known data and information gaps and/or those data needs identified through database review. Every attempt would be made to use and glean data from existing, ongoing programs and to direct the collection of data that would augment, not replace,

1 these programs. Monitoring protocols and research studies would be designed to avoid  
2 excessive disturbance to covered species and to ensure that monitoring and research are  
3 conducted in compliance with all permit stipulations.

4 The LCR MSCP Program Manager would maintain close coordination with other recovery  
5 implementation programs and habitat conservation programs in the Colorado River watershed,  
6 including the Upper Colorado River Endangered Fish Recovery Program, the Glen Canyon  
7 Dam Adaptive Management Program, the Clark County MSHCP and others that may develop  
8 through the life of the LCR MSCP. Additionally, communication and coordination would be  
9 maintained with other species conservation planning and habitat restoration efforts that are in  
10 place within the range of the species covered under the Conservation Plan (e.g., southwestern  
11 willow flycatcher research and habitat restoration activities along the middle Rio Grande in  
12 central New Mexico).

13 The purpose behind this close communication and coordination is to ensure and facilitate the  
14 transfer and management of data and information related to key species and the employment of  
15 state-of-the-art restoration technologies. LCR MSCP monitoring protocols would be developed  
16 in coordination with the National Fish and Wildlife Foundation's Partner's in Flight programs  
17 in Arizona, California, and Nevada to ensure that results of LCR MSCP monitoring are  
18 compatible with and can be integrated with data collected on covered species and habitat  
19 restoration efforts under these programs. This coordination would allow for comparable data  
20 to be collected that can be used to better evaluate the regional status and trends of species and  
21 to identify and direct future management efforts to benefit these species. Identification of such  
22 regional management needs based on coordinated regional monitoring efforts would not only  
23 help guide adaptive implementation of the Conservation Plan but would also provide such  
24 guidance for other species conservation programs. Additionally, monitoring protocols would  
25 be designed and developed that permit coordinated database management, as well as database  
26 compatibility with other conservation planning efforts (e.g., databases developed, maintained,  
27 and managed in the Glen Canyon Dam Adaptive Management Program, Upper Colorado River  
28 Basin Recovery Implementation Program, and Roosevelt Lake HCP).

#### 29 *System Monitoring*

30 System monitoring would be conducted to collect data on existing populations and habitats of  
31 covered species to determine their status, distribution, density, migration, productivity, and  
32 other ecologically important parameters. System monitoring would be implemented annually,  
33 with decreasing intensity over the term of the LCR MSCP. Collected data would be maintained  
34 in a GIS database (e.g., distribution of habitats, species observations) and other database  
35 formats as appropriate.

36 In the early years of Conservation Plan implementation, extensive data gathering would be  
37 conducted to acquire and sort data on covered species to identify data gaps and research  
38 questions that would be addressed through the adaptive management process. At the same  
39 time, ongoing monitoring of endangered species currently performed by Reclamation would  
40 continue. Additionally, productivity and survival for other avian species would be gathered  
41 through continued monitoring at two data Monitor Avian Productivity and Survival (MAPS)  
42 stations located in patches of riparian land cover along the LCR (one on created habitat and one  
43 on existing habitat that would not be affected by covered activities). If the appropriate sites are

identified and become available for use, it may be feasible to establish one or more additional MAPS stations within the planning area.

As data gaps are identified, monitoring actions, primarily directed toward covered species for which little is known from the LCR (i.e., mammals, amphibians, insects) would be designed, scheduled, and implemented. Monitoring data would itself be reviewed to determine species-specific and habitat creation-specific research needs. For example, the status and distribution of the Colorado River cotton rat is unknown. (None have been seen or collected for a few years.) Small mammal trapping would need to be implemented in areas previously known to be occupied by this species. If the species is located, species-specific research studies would need to be undertaken to determine the relationship between the organism and its environment. Data collected through such species-specific research efforts would then be used to refine or modify Conservation Plan conservation measures to ensure the species' LCR MSCP conservation goals are achieved.

An important aspect of system monitoring includes the development and use of consistent monitoring and research protocols. Monitoring and research plan designs and database management techniques and methodologies should, to the maximum extent practicable, conform to protocols identified or developed in existing species recovery plans, Partner's in Flight bird conservation plans, and other species-related conservation planning efforts.

It is anticipated that system monitoring could decrease during the later years of LCR MSCP implementation because post-development monitoring on established sites would provide the data necessary to evaluate the overall health and well-being of these species.

### *Species Research*

The LCR MSCP participants recognize that there are considerable data gaps for many of the covered species and that these data are needed to guide, through the adaptive management process, the design and implementation of effective conservation measures. Through the adaptive management process, LCR MSCP implementation would be informed and enhanced by the collection of basic life history data, such as food habits, migration timing, and the physical-, chemical-, and biological-limiting factors necessary to design, construct, and manage the requisite habitats necessary to ensure the continued survival of the species.

The LCR MSCP Program Manager would determine, in cooperation with the Service, the appropriate scope of these species-specific research programs and activities. As described for system monitoring, the LCR MSCP participants would coordinate with, participate in, and build on extant research for these species. Some of the species research items currently identified include brown-headed cowbird and starling control, bat roost and forage site identification, MacNeill's sootywing skipper habitat requirements, and flannelmouth sucker investigations below Davis Dam.

### *Restoration Research*

Restoration technology and methodology research is a key element for successful implementation of habitat establishment through the adaptive management process. Most of the habitats to be created under the LCR MSCP involve a continuation, completion, or



1 expansion of actions currently being tested and implemented by Reclamation as part of  
2 previous BOs (e.g., some Reclamation projects, such as backwater development, have been  
3 implemented as mitigation as long as 30 years ago). Many of Reclamation's ongoing restoration  
4 projects are demonstration projects that were designed and implemented to answer some of the  
5 multitude of questions surrounding restoration of native aquatic, marsh, and riparian  
6 communities in the Colorado River floodplain. Much of this work would still be under  
7 investigation as the Conservation Plan moves into the implementation phase. In many ways,  
8 these actions are still conceptual in nature.

9 Initially, a major focus of restoration research would be to conduct site evaluations to collect the  
10 information necessary to select conservation areas based on the conservation area site-selection  
11 criteria. Substantial pre-restoration evaluation and inventory would be required to ensure that  
12 the best sites are selected.

### 13 *Post-development Monitoring*

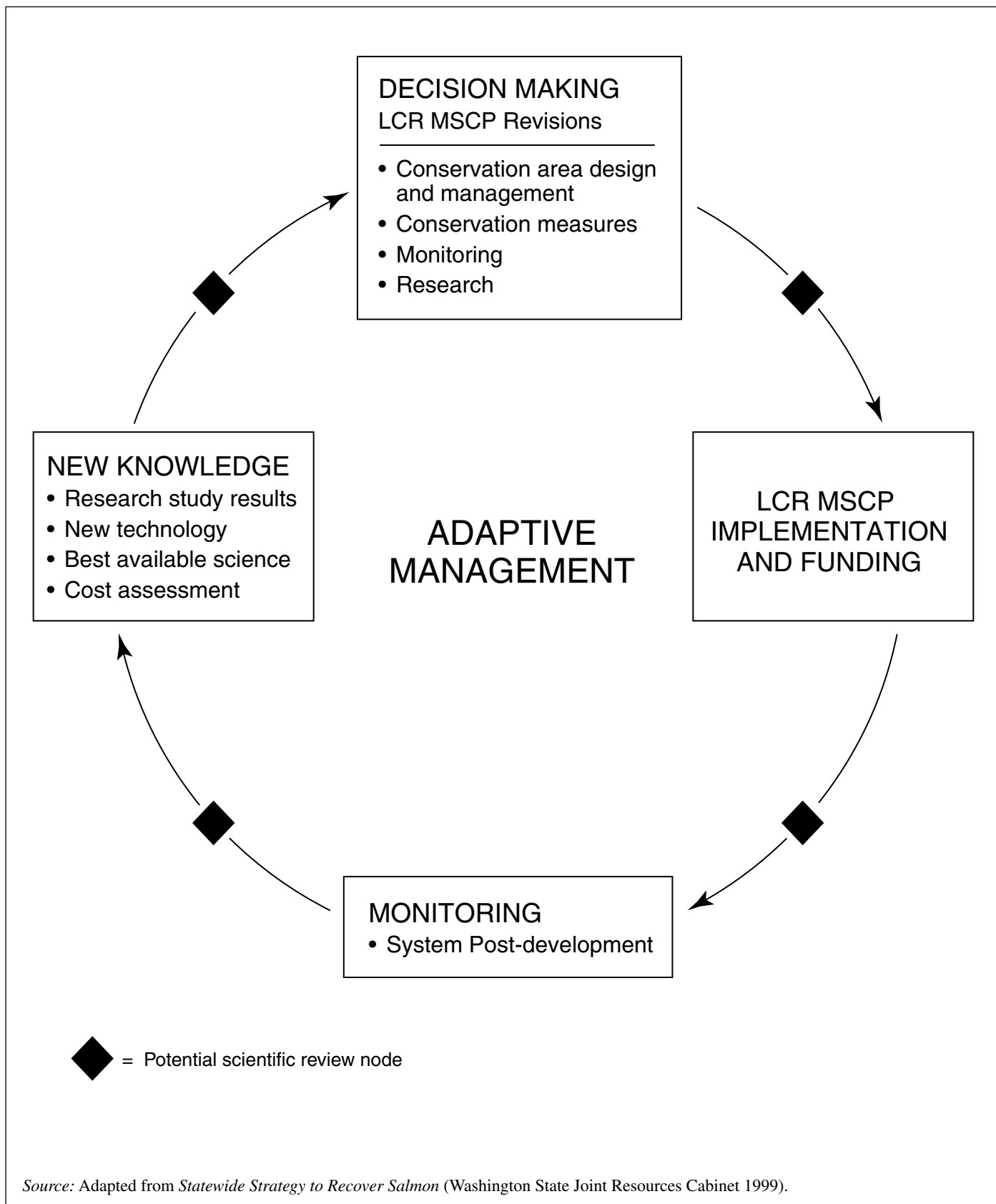
14 Following completion of habitat creation activities (e.g., site grading, plant installation) at each  
15 conservation area, post-development monitoring would be conducted to evaluate development  
16 of the site as covered species habitat (e.g., growth of vegetation, development of elements of  
17 species habitat) and use of the habitat by covered species. Data collected about how created  
18 habitat develops relative to the habitat creation techniques used to establish and maintain the  
19 habitat would be used to refine management techniques to ensure the most cost-effective  
20 approaches are used (e.g., water management). An element of post-development monitoring  
21 also includes monitoring of the parameters established for established covered species habitats  
22 to determine whether the minimum habitat requirements established for each species' habitat  
23 are being achieved.

#### 24 **2.1.1.8 Adaptive Management**

25 Uncertainty is an unavoidable component of creating and managing species habitats since  
26 conditions within the planning area and the status of covered species may change during the  
27 term of the LCR MSCP. To address such uncertainties, the LCR MSCP Program Manager  
28 would implement the LCR MSCP based on the principles of adaptive management, which  
29 would allow LCR MSCP conservation measures to be adjusted over time based on results of  
30 monitoring and research.

31 The adaptive management process would be administered by the LCR MSCP Program  
32 Manager, with input from the LCR MSCP Steering Committee, and would provide the Program  
33 Manager with objective scientific data and analyses on which to base management decisions.  
34 Figure 2.1-11 conceptually illustrates the adaptive management process.

35 The LCR MSCP adaptive management process is intended to be a flexible, iterative approach to  
36 long-term habitat creation and management of biological resources and would be influenced  
37 over time by the results of ongoing monitoring, research, and other sources of information.  
38 Conservation measures, habitat creation actions, and resource management techniques would  
39 be regularly evaluated in light of monitoring and research results regarding species needs,  
40 habitat creation successes and failures, and other factors. The intent of this evaluation process is



**Figure 2.1-11. Adaptive Management Process**

1 to better achieve overall conservation and management goals as defined by measurable  
2 biological objectives.

3 The cornerstone of the adaptive management process is the LCR MSCP monitoring and  
4 research program. Information collected through monitoring and research would be used to  
5 design and manage created habitat and provide information to direct the fish augmentation  
6 element of the LCR MSCP. During the early phases of LCR MSCP implementation, monitoring  
7 and research would provide data to improve the efficacy of techniques to successfully establish  
8 habitat. As habitats are established, the adaptive management process would allow for the  
9 experience gained through early projects to shape and refine future habitat creation projects.

10 The data collected, evaluated, and managed through the monitoring and research program  
11 would provide a scientific basis for modification of existing projects or development of  
12 alternative measures that would provide greater benefits or more efficient use of LCR MSCP  
13 resources. Such modified/alternative measures would be developed as written proposals and  
14 would be presented to the LCR MSCP Steering Committee by the LCR MSCP Program  
15 Manager, together with an estimate of the costs. These proposals would be evaluated to ensure  
16 that they are consistent with the LCR MSCP goals and can be accomplished within the limits of  
17 the budget and financing assurances of the LCR MSCP participants.

18 Action plans and budgets, reflecting the implementation of conservation projects, will be  
19 presented to the Service for its review and written concurrence that they conform to the terms  
20 and conditions necessary or appropriate for purposes of the incidental take authorization.  
21 Modified/alternative conservation measures and methods that have been generated through  
22 the adaptive management process, proposed by the LCR MSCP Program Manager, reviewed by  
23 the LCR MSCP Steering Committee, and with concurrence of the Service would not require an  
24 amendment to the section 10(a)(1)(B) permit or re-initiation of the section 7 consultation.

25 Recovery plans could be developed for Federally listed species or LCR MSCP species that  
26 become listed over the 50-year life of the LCR MSCP. The LCR MSCP adaptive management  
27 process allows for revisions of objectives and conservation measures to incorporate recovery  
28 strategies identified in new or revised recovery plans.

#### 29 **2.1.1.9 Conceptual Habitat Conservation Actions**

30 Table 2.1-9 summarizes the key elements that would be involved in implementing the five  
31 habitat creation and maintenance concepts that would be incorporated into an integrated  
32 mosaic of habitats. The five concepts are:

- 33 1. Converting agricultural land to cottonwood-willow and/or mesquite habitat.
- 34 2. Converting undeveloped lands to cottonwood-willow and/or mesquite habitat.
- 35 3. Creating marsh.
- 36 4. Creating backwaters.
- 37 5. Maintaining existing habitat (this refers to the LCR MSCP's contribution to maintaining  
38 the condition of a portion of existing habitat for covered species within the planning  
39 area).

1

**Table 2.1-9. Key Elements of Habitat Establishment and Maintenance Concepts**

<i>Key Elements of Concepts</i>	CONCEPT <sup>1</sup>				
	1	2	3	4	5
Clearing existing vegetation.	X	X	X	X	
Using existing water delivery infrastructure where possible.	X				
Upgrading, augmenting, or enhancing the pumping system, canals, and drains where needed.	X				X
Grading and contouring to provide distribution canals, side channels, swales, and berms to support cottonwood-willow and mesquite land cover types.	X	X			
Designing/constructing water infrastructure to allow for flood irrigation of cottonwood-willow and seasonal creation and maintenance of moist soils.	X	X			X
Revegetating using methods that include but are not limited to pole planting (vertical or horizontal), planting container-grown trees and shrubs, natural seeding from early plantings, and hydroseeding	X	X	X		
Identifying potential maintenance and management measures to ensure long-term viability of the conservation site.	X	X	X	X	
Installing drip irrigation where needed to irrigate mesquite plantings	X	X			
Creating low-lying areas for water retention through dredging, surface excavation, or other means.	X	X	X		
Establishing a water inflow and outflow system to maintain water depth and extent. Establishing water inflow through the groundwater table, surface water inlet and outlet facilities, or attachment to canal distribution network.	X	X	X	X	
Revegetating with shoots, seeds, or other propagules.	X	X	X		
Establishing a backwater area through dredging, surface excavation, or other means. This concept could include shallow water habitat.				X	X
Designing all water inflow and outflow facilities to prevent the movement of non-native aquatic species into the backwater if it is being established for native fish.				X	
Maintaining marsh vegetation by burning, water delivery, and other means.			X		X
Removing or controlling undesirable vegetation such as saltcedar and <i>Arundo</i> ; and other appropriate means to maintain existing desirable habitat conditions.	X	X	X		X
1 Concepts are 1) converting agricultural land to cottonwood-willow and/or mesquite habitat; 2) converting undeveloped lands to cottonwood-willow and/or mesquite habitat; 3) establishing marsh; 4) establishing backwaters; and 5) maintaining existing habitat.					

### 2.1.2 Alternative 2: No Action Alternative

The no action alternative describes a reasonable assumption of the expected future situation that would result if the Conservation Plan were not implemented as proposed and the section 10(a)(1)(B) permit were not issued. This alternative is based on the following assumptions regarding the actions that would be taken in the absence of the LCR MSCP.

#### *Assumptions*

- A comprehensive, regional multi-species conservation plan would not be implemented by non-Federal and Federal entities.
- The Service would not issue a comprehensive section 10(a)(1)(B) permit to the states of Arizona, California, and Nevada for incidental take resulting from the covered activities.
- The covered activities described in the LCR MSCP BA and LCR MSCP HCP would likely be implemented, but regulatory compliance would be required and applied on a case-by-case basis as each activity is considered and approved. The types of conservation measures and strategies described for the proposed Conservation Plan would likely be adopted to offset the impacts of each activity, but would be planned and implemented independently for each activity. Conservation could occur in the planning area as well as in the off-site conservation areas described below under Alternative 4. These include the lower reaches of the Virgin and Muddy rivers, Bill Williams River, and Gila River. In the absence of a comprehensive, coordinated conservation program, the following would be expected:
  - It is unlikely that funding would be provided to maintain existing habitat that is not impacted by the individual projects.
  - The individual project mitigation programs likely would not provide the regional wildfire suppression and law enforcement funding proposed in the Conservation Plan.
  - Coordinated monitoring and adaptive management programs would not be implemented.
  - Since each individual project would establish its own mitigation sites, it is likely that more maintenance and storage facilities would be required.
  - More, smaller mitigation sites would be established, requiring more infrastructure (access roads and irrigation pipelines/canals and pump facilities).
  - To the extent that the agencies undertaking the covered activities proceed with ESA compliance, there may be a reduced number of covered species because unlisted species likely would not be included. This would result in a reduction in the amount of habitat required.

#### *Federal Regulatory Compliance Actions*

- All Reasonable Prudent Measures (RPMs) and Reasonable Prudent Alternatives (RPAs) for the 1997 and 2002 BOs must be completed by April 30, 2005, when the current BO expires. Reclamation would need to reinitiate consultation with the Service on LCR

operations and maintenance activities, and the Service would issue a new BO, which may contain conservation measures or requirements not in the original 1997 BO or the 2002 extension. It is likely that Reclamation's consultation with the Service regarding ongoing operations and maintenance activities would incorporate the future actions for which coverage is provided by the proposed Conservation Plan.

- The provisions of the 2001 BO regarding the change in point of diversion of up to 400 kaf from Imperial Dam to Lake Havasu would remain in effect, assuming that the exchange is accomplished, until the time limits set in the BO expire.
- Future Federal actions would be required to comply with NEPA, the ESA, and other laws and regulations; compliance and permit requirements would be implemented on a case-by-case basis.
- It is likely that conservation measures similar to those of the proposed action would be implemented to comply with regulatory requirements, with the exceptions described above under "Assumptions."

### *Non-Federal Regulatory Compliance Actions*

- Ongoing and future actions in Arizona, California, and Nevada would be required to comply with permit requirements, where appropriate, and all applicable laws and regulations. There is a reasonable possibility that potential non-Federal permittees would conclude that they do not require a section 10(a)(1)(B) permit for their activities, either because they choose not to implement those activities or they determine that their activities do not cause incidental take of protected species.

### *Ongoing Conservation Actions*

- Conservation actions by Federal agencies that are tied to section 7 consultations under section 7(a)(2) would continue to be implemented as part of that proposed action or under the requirements of the BO. Implementation would cease only under the terms of the BO.
- Voluntary conservation actions initiated by Federal agencies under section 7(a)(1) would continue to be implemented at the discretion of the Federal agency.
- Voluntary conservation actions initiated by state agencies, tribes, or private groups would continue to be implemented at the discretion of the funding entity.
- Implementation of existing recovery plans for listed species would continue as Federal and non-Federal partners provide funding for specific projects relevant to the planning area.

#### **2.1.3 Alternative 3: Implementation of a Conservation Plan Addressing ESA-Listed Species Only and Issuance of a Section 10(a)(1)(B) Permit (ESA-Listed Species Only)**

This alternative would provide coverage only for those species listed under the ESA, and it would result in the issuance of a section 10(a)(1)(B) permit by the Service. Covered species would be the Yuma clapper rail, southwestern willow flycatcher, desert tortoise, bonytail,

humpback chub, and razorback sucker. The amount of take authorized would be as shown on Tables 2.1-2 and 2.1-3 for these species. This alternative would differ from the proposed action primarily in that no honey mesquite and less cottonwood-willow and marsh land cover would need to be established. Additionally, no take permit would be issued for unlisted species, and specific benefits for those species would not occur. Under this alternative, the Conservation Plan would be implemented in the same geographic area as the proposed action and would include:

- Establishment of a \$25 million fund to support projects implemented by land use managers in the planning area that maintain existing habitat for listed species that would be covered by the Conservation Plan under this alternative;
- Creation of native habitat in the planning area (4,050 acres of cottonwood-willow, 382 acres of marsh, and 360 acres of backwaters);
- Long-term management of established habitat to maintain and preserve ecological functions;
- Avoidance and minimization of impacts resulting from covered activities and Conservation Plan implementation on listed species and their habitat;
- Population enhancement measures intended to directly or indirectly increase abundance of listed species; and
- Adaptive management measures, including monitoring and research necessary to assess and improve conservation measure effectiveness.
- Other conservation measures relating to the listed species and the strategies for implementing them, as discussed in section 2.1.1.

#### **2.1.4 Alternative 4: Off-Site Conservation and Issuance of a Section 10(a)(1)(B) Permit (Off-Site Conservation)**

The off-site conservation alternative would involve the application for and issuance of a section 10(a)(1)(B) permit for the same covered activities and covered species as the proposed action. The level of impacts to covered species, including the amount of authorized take that is requested, is the same for this alternative as for the proposed action, and therefore, the same level of conservation measures would be proposed to mitigate the impacts, including:

- Establishing a \$25 million fund to support projects implemented by land use managers in the planning area that maintain existing covered species' habitat;
- Creation of native habitat (5,940 acres of cottonwood-willow, 1,320 acres of honey mesquite type III, 512 acres of marsh, and 360 acres of backwaters);
- Long-term management of created habitat to maintain and preserve ecological functions;
- Avoidance and minimization of impacts resulting from covered activities and Conservation Plan implementation on covered species and their habitat;
- Population enhancement measures intended to directly or indirectly increase abundance of covered species;

- Adaptive management measures, including monitoring and research necessary to assess and improve conservation measure effectiveness; and
- Other conservation measures relating to the covered species and the strategies for implementing them, as discussed in section 2.1.1.

The only difference between this alternative and the proposed action is that habitat generally would be created along tributaries to the LCR. Fish conservation, including the creation of 360 acres of backwaters and fish augmentation strategies, would continue to take place in the mainstem, reservoirs, and backwaters of the LCR. For purposes of analysis, it is assumed that created habitat would be equally distributed between the three off-site conservation areas.

Potential off-site locations for implementing the Conservation Plan elements are: (1) the lower reaches of the Muddy River/Moapa Valley and Virgin River, proceeding upstream from the confluences with Lake Mead and overlapping the NDOW's Overton Wildlife Management Area (Figure 2.1-12); (2) the lower reach of the Bill Williams River, proceeding upstream from the confluence with the LCR and overlapping the Bill Williams NWR, to Alamo Dam (Figure 2.1-13); and/or (3) lower Gila River Valley, proceeding upstream from the LCR planning area and extending approximately ten miles east of Mohawk Valley (Figure 2.1-14). Land ownership for each of the off-site conservation areas is shown on Table 2.1-10. These locations were selected because they:

1. Provide essentially the same benefits to local-to-regional populations of covered species that would be provided by the proposed Conservation Plan. They are in close proximity to the planning area so that mitigation is effective at addressing local ecosystem concerns.
2. They would productively combine with and enhance other conservation efforts that are being and would be applied along the LCR mainstem through other initiatives.
3. They span the same range of ecological communities as the planning area, providing ecological counterparts to the upper (Reaches 1-2), middle (Reaches 3-5), and lower (Reaches 6-7) portions of the planning area.

In addition to the information used to develop the proposed Conservation Plan, the following key sources were consulted to identify the best locations for Alternative 4:

- *An Ecological Analysis of Conservation Priorities in the Sonoran Desert Ecoregion* (Marshall et al. 2000).
- *The Arizona Partners in Flight Bird Conservation Plan* (Latta et al. 1999).
- *The Final Recovery Plan for the Southwestern Willow Flycatcher* (USFWS 2002d).
- The Nevada Natural Heritage Program (NNHP) (2000) *Scorecard 2000: Highest Priority Conservation Sites*.
- The Southern Nevada Public Land Management Act's (SNPLMA 2003) website information on conservation land acquisition priorities (<http://www.nv.blm.gov/snplma/default.asp>).



**Table 2.1-10. Land Ownership in the Off-Site Conservation Areas (Acres)**

<i>Land Owner</i>	<i>Lower Muddy and Virgin Rivers</i>	<i>Lower Bill Williams River</i>	<i>Lower Gila River Valley</i>
U.S. Bureau of Reclamation	0	0	0
U.S. Fish & Wildlife Service	0	2,187	0
Bureau of Land Management	7,524	10,004	45,003
U.S. Forest Service	22	0	0
Department of Defense	0	0	4,176
State	2,321	1,773	10,230
Private	7,958	7,426	92,716
National Park Service	318	0	0
Unknown	0	0	10
<b>Acreage Totals</b>	<b>18,142</b>	<b>21,390</b>	<b>152,135</b>

- Reclamation's (USBR 1999a) *Long Term Restoration Program for the Historical Southwestern Willow Flycatcher (Empidonax traillii extimus) Habitat along the Lower Colorado River* (Response to the Service pursuant to Reasonable and Prudent Alternative #11 from the 1997 BO).
- Other documents as cited.

#### 2.1.4.1 Lower Muddy and Virgin Rivers

The areas included in this off-site conservation area include large acreages of land in private ownership that surrounds riverine aquatic and riparian habitat. Within both privately and publicly held lands there are numerous areas of opportunity for creating and/or maintaining aquatic and riparian habitat. These areas include existing and potential southwestern willow flycatcher habitat that is important to the recovery of the species (USFWS 2002d). Previously

identified conservation opportunities include 620 acres of potential habitat for southwestern willow flycatcher on private lands along a 15-mile stretch of the Virgin River upstream from Lake Mead to the Overton Wildlife Management area (USBR 1999a). Similarly, extensive private lands exist along the lower Muddy River in Moapa Valley.

This off-site conservation area includes habitat conservation opportunities for a number of species that are not known to occur in the other two areas: the desert pocket mouse; the relict leopard frog; and MacNeill's sootywing skipper. Conservation actions within this area would accordingly give priority to meeting the needs of these species. This area also contains two Federal- and Nevada-listed endangered fish species that are not covered by the proposed Conservation Plan: the woundfin (*Plagopterus argenteus*) and Virgin River chub (*Gila seminuda*).

The covered species that occur or are likely to occur in each of the off-site conservation areas and would benefit from habitat creation and maintenance efforts are shown on Table 2.1-11.

**Table 2.1-11. Species for which Habitat Establishment or Maintenance Could Occur in Each of the Off-Site Conservation Areas**

<i>Species Name</i>	<i>Lower Muddy and Virgin Rivers</i>	<i>Lower Bill Williams River</i>	<i>Lower Gila River Valley</i>
Pale Townsend's big-eared bat	X	X	
Western yellow bat	X	X	X
Western red bat	X	X	X
California leaf-nosed bat	X	X	X
Desert pocket mouse	X		
Colorado River cotton rat		X	
Yuma hispid cotton rat			X
Western least bittern	X	X	X
Yuma clapper rail	X	X	X
California black rail		X	X
Western yellow-billed cuckoo	X	X	X
Gilded flicker		X	X
Gila woodpecker		X	X
Southwestern willow flycatcher	X	X	X
Vermilion flycatcher	X	X	X
Arizona Bell's vireo	X	X	X
Sonoran yellow warbler	X	X	X
Summer tanager	X	X	X
Elf owl		X	
Relict leopard frog	X		
Lowland leopard frog		X	
MacNeill's sootywing skipper	X		
<i>Source: NNHP 2000; Marshall et al. 2000; see also species information included in the LCR MSCP HCP</i>			

### Water Supply

The Law of the River enjoins the Secretary from charging water use on the tributaries against a state's apportionment. In the case of the Muddy and Virgin rivers, laws of the State of Nevada govern the diversion and use of water. The doctrine of prior appropriation governs surface water rights in Nevada. An appropriative right is the right to divert a specified quantity of water at a specified point of diversion for reasonable and beneficial uses at a specified place of use for a specified manner of use. Appropriative rights are generally "first-in-time, first-in-right"; that is, one appropriative right has priority over appropriative rights established later. Water diverted under an appropriative right may be used on lands not contiguous with the watercourse and on lands outside of the watershed, and appropriative rights may authorize the seasonal storage of water. Before 1905, appropriative rights could be established simply by diverting water and applying it to the beneficial use. In 1905, the Nevada State Legislature enacted the process for establishing appropriative rights. The Nevada State Engineer through the Nevada Division of Water Resources (NDWR) administers all surface water rights in the

state. An appropriative water right granted by NDWR is required to divert and consumptively use water in the State of Nevada. Nevada has established procedures for the transfer of appropriative water rights and the transfer of a place of use for a water right (see Title 48, Chapter 533 of the Nevada Revised Statutes).

The NDWR had adjudicated both the Virgin and Muddy rivers. The adjudication process in Nevada focuses on verifying and quantifying pre-statutory water rights, as well as Native American Indian and Federal reserved water rights. An adjudication of surface water claims, other than claims of Native American Indian or Federal reserved rights, involves those rights established before the enactment of Nevada's statutory water law in 1905. Both the Virgin and Muddy rivers are considered "fully appropriated" or "fully designated" meaning all flows in the river have been appropriated to a water right holder and no additional water is available for a new appropriative water right.

LCR MSCP parties would obtain Virgin River and Muddy River waters for implementing the Conservation Plan projects from various sources in accordance with Nevada law and in coordination with the Nevada parties to the LCR MSCP whose water rights may be affected by the use. The legal structure governing water rights within Nevada would ensure that these uses would not increase the amount of Virgin River and Muddy River water used beyond existing apportionments. The geographic scope of Alternative 4 (Figure 2.1-12) would ensure that Virgin River and Muddy River water that would be used by the LCR MSCP is used within the respective historic floodplain of each river.

#### **2.1.4.2 Lower Bill Williams River**

The area of interest includes the Bill Williams NWR, where riparian vegetation restoration and management efforts are ongoing. Planet Ranch, owned by the City of Scottsdale, includes 8,400 acres, of which 2,300 acres are within the floodplain. It surrounds existing and potential riparian and aquatic habitats upstream of the refuge and includes water rights. The Bill Williams River is one of the key Management Units identified in the Service's (2002d) Recovery Plan for the southwestern willow flycatcher. Additionally, The Nature Conservancy (TNC) (in Marshall et al. 2000) identified the Bill Williams Complex, including the reach of the river under consideration here, as harboring a large number of regionally important species and habitats, making it one of the priority sites for the conservation of biodiversity. Creation of cottonwood-willow riparian habitat and honey mesquite would be given priority in this off-site conservation area.

#### **Water Supply**

As discussed above, the Law of the River only governs the diversion and use of water on the mainstream of the Colorado River. The laws of the State of Arizona govern the diversion and use of water from the Bill Williams River. The doctrine of prior appropriation (described above) also governs surface water rights in Arizona (see Title 45, Chapter 1 of the Arizona Revised Statutes). Before June 1919, appropriative rights could be established simply by diverting water and applying it to the beneficial use, or by posting a notice and recording a water right claim with the county recorder. The Arizona State Legislature enacted the Public Water Code in 1919 and established a procedure for obtaining appropriative rights under the Arizona Water Code. The Water Rights Registration Act of 1974 established a procedure for registering water rights

that existed prior to June 1919. Water rights may also be established pursuant to the Stockpond Registration Act of 1977, for stockponds constructed after June 12, 1919 and prior to August 27, 1977. The Arizona Department of Water Resources (ADWR) now administers all surface water rights in the state. To avoid abandonment and subsequent forfeiture of an appropriative water right granted by the state the rightholder is required to beneficially use that water in the State of Arizona. Arizona has established procedures for the transfer or exchange of surface water rights and the transfer of a place of use for a water right (see Title 45, Chapters 1 and 4 of the Arizona Revised Statutes). The Bill Williams River is considered fully appropriated.

LCR MSCP parties would obtain Bill Williams River water for implementing the Conservation Plan projects from various sources in accordance with Arizona law and in coordination with the Arizona parties to the LCR MSCP whose water rights may be affected by the use. The legal structure governing water rights within Arizona would ensure that these uses would not increase the amount of Bill Williams River water used beyond existing apportionments. The geographic scope of Alternative 4 (Figure 2.1-13) would ensure that Bill Williams River water that would be used by the LCR MSCP is used within the historic floodplain of the river.

### 2.1.4.3 Lower Gila River

Reclamation (1999a) identified promising opportunities for riparian restoration and management to benefit willow flycatcher in newly reestablishing areas of cottonwood-willow near Wellton. Tacna Marsh is one of the priority sites identified by TNC for the conservation of biodiversity (Marshall et al. 2000) and includes extensive marshes that provide habitat for Western least bittern and Yuma clapper rail.

The lower Gila River Valley encompasses habitat and conservation opportunities for southern species that are not known or likely to occur at the other sites, including the Yuma hispid cotton rat, flat-tailed horned lizard, and Colorado River toad. Conservation actions in this area would give priority to the needs of these species, along with the establishment of cottonwood-willow, honey-mesquite, and marsh habitats.

### Water Supply

Water for irrigation along the lower Gila River is Colorado River mainstem water, and the lower Gila River conveys irrigation return flows back to the Colorado River. Therefore, the use of water for LCR MSCP conservation projects in this area must comply with the Law of the River. LCR MSCP parties would obtain Colorado River water to meet these requirements from various sources in accordance with the Law of the River and in coordination with the Lower Basin State(s) whose apportionment may be affected by the use. The legal structure governing the Colorado River would ensure that these uses would not increase the amount of water used in the lower Colorado River basin beyond existing entitlements. The geographic scope of Alternative 4 (Figure 2.1-14) would ensure that Colorado River water that would be used by the LCR MSCP is used within the historic floodplain of the Gila River, a tributary of the lower Colorado River.

## 2.2 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

During the development of the proposed Conservation Plan and the public scoping process, several concepts were proposed as potential alternatives to the proposed action. These alternatives were eliminated from detailed analysis because they did not substantially meet the goals and objectives of the LCR MSCP, did not provide a basis for issuance of incidental take authorizations pursuant to the ESA, or they resulted in potentially greater environmental consequences. The alternatives that were identified but eliminated from consideration include the following:

- Alternative A: Re-operation of the LCR without Modification of Existing Structures;
- Alternative B: Dam Removal;
- Alternative C: Removal of Banklines, Levees, and Similar Modifications;
- Alternative D: Use of Conserved Water for Environmental Purposes on the LCR;
- Alternative E: Larger-Scale Conservation Plan; and
- Alternative F: Longer or Shorter Permit Duration.

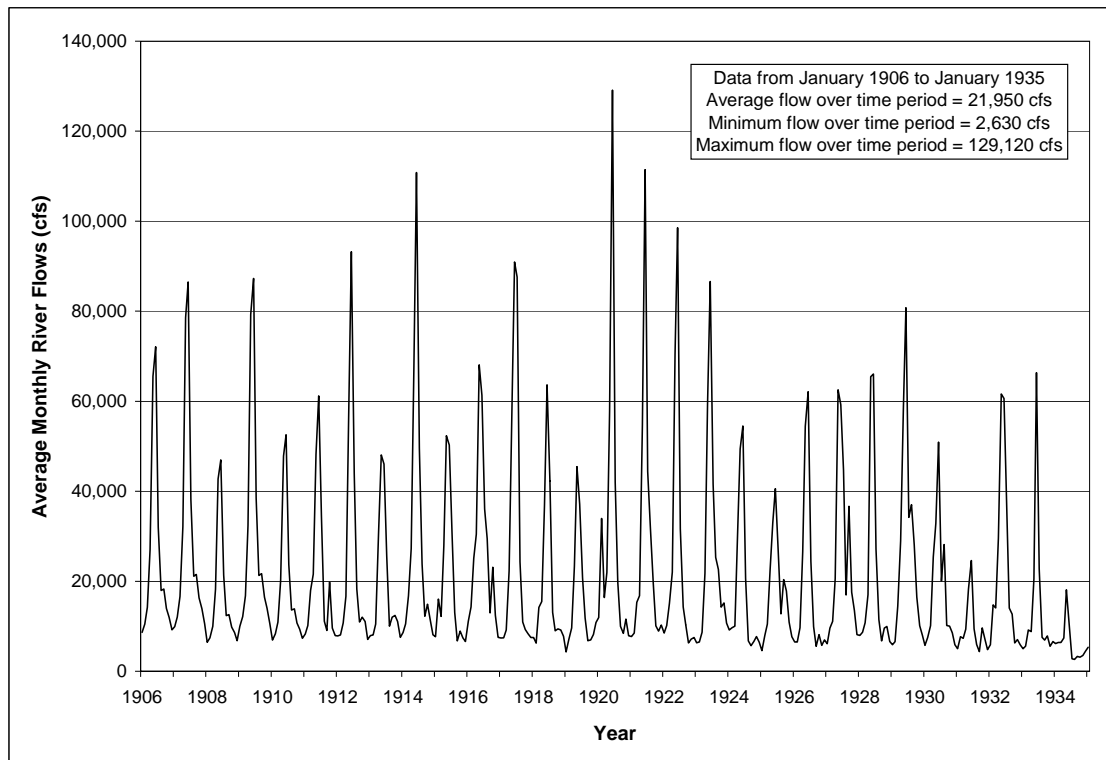
### 2.2.1 Operational or Structural Changes to the Lower Colorado River

Comments provided during the 1999 and 2000 scoping sessions identified a number of measures that would result in potential changes to the current environment along the LCR intended to reduce or eliminate the impacts to sensitive species from existing structural modifications and ongoing operational practices. These are not alternatives to the proposed action (implementation of a Conservation Plan and issuance of a section 10(a)(1)(B) permit), but they have been included for discussion because they were raised during scoping. The suggested measures include re-establishing the historic hydrograph and sediment regime of the LCR; removing, relocating, or destabilizing many of the existing banklines, levees, and other structures along the river; removing one or more of the major dams on the mainstem of the river; requiring more water conservation, and developing alternative water sources in coastal Southern California in order to divert less water from the Colorado River system. These measures were combined into four alternatives: (A) re-operation of the LCR without modifications to existing structures, (B) removal of dams on the LCR, (C) removal or modification of banklines and levees on the LCR, and (D) reducing demand for Colorado River water and dedicating the conserved Colorado River water to environmental uses along the river.

#### 2.2.1.1 *Alternative A: Re-Operation of the Lower Colorado River without Modifications to Existing Structures*

This alternative would include the modification of current LCR operations from Hoover Dam to Morelos Diversion Dam for the benefit of species and habitats throughout the planning area. It would involve modifying releases of water from the dams along the LCR to better mimic the historic hydrograph. Figure 2.2-1 shows monthly average flows below Hoover Dam from January 1906 to January 1935 (prior to the beginning of storage in Lake Mead in February 1935).

These flows represent the historic (pre-dam) hydrograph. As shown on Figure 2.2-1, the average of all the monthly average flows over this time period was approximately 21,950 cubic feet per second (cfs), and the maximum of all the monthly average flows was approximately 129,120 cfs (June 1920). Because this is based on monthly average flows, actual daily flows could be substantially higher or lower than the monthly averages; thus, 120,000 cfs is used to represent the historic peak flow below Hoover Dam.



**Figure 2.2-1. Average Monthly Colorado River Flows below Hoover Dam from January 1906 to January 1935**

The intent of this alternative would be to release water in sufficient volumes and duration to inundate key portions of the historic floodplain to induce restoration of some measure of natural riverine function to selected reaches (based upon ecological or biological criteria) during the 50-year implementation period. Modifications to or removal of existing structures located within the river would not occur.

Several physical and institutional issues reduce or eliminate the effectiveness and feasibility of this alternative. This alternative has been eliminated for the following reasons:

1. Controlled releases<sup>5</sup> from Hoover Dam currently are limited to approximately 73,000 cfs by the physical constraints of the dam. This is far below the historic peak river flow of approximately 120,000 cfs. To release greater than 73,000 cfs from the dam, an uncontrolled release must be made. Uncontrolled releases (releases over the spillway) can range from a small amount up to 400,000 cfs in extreme flood conditions, depending on the lake level relative to the spillway crest. To release the additional approximately 50,000 cfs needed to obtain a total release of 120,000 cfs, water levels in Lake Mead must be at least 1212.5 feet above mean sea level (msl), or approximately 7.1 feet above the spillway crest (1205.4 feet above msl) [U. S. Army Corps of Engineers (USACE) 1982]. A release from the dam of 120,000 cfs is feasible, although this release can only occur under certain lake level conditions, which generally occur only after a series of wetter hydrologic years.

To be effective for enhancement of habitat for aquatic and floodplain associated species, the 120,000 cfs release from Hoover Dam would need to be maintained through the LCR system (i.e., a corresponding release would need to be made at Davis and Parker dams) rather than re-captured in Lake Mojave or Lake Havasu. Controlled releases from Davis Dam currently are limited to about 44,000 cfs, of which a maximum of 31,000 cfs can be released through the powerplant. Uncontrolled releases from Davis Dam via the spillway can be up to 214,000 cfs, depending on lake level (USACE 1982). Controlled releases from Parker Dam are limited to 22,600 cfs, the amount of water that can be released through the powerplant. Uncontrolled releases from Parker Dam via the spillway can be up to 400,000 cfs. Overall, it would be physically feasible to release 120,000 cfs through the LCR dams; however, a release of this amount of water could result in damage to these structures (and the smaller structures such as Palo Verde Diversion Dam, Headgate Rock Dam, Imperial Dam, and others) along the LCR. It also would result in a substantial loss of revenue from power generation not realized. In addition, as discussed in number 3 below, under a release regime that would mimic the natural hydrograph of the river, a substantial amount of water could not be diverted for consumptive use since Lake Havasu is the last major reservoir in the LCR system that could re-capture all or the majority of the releases from Hoover Dam. It also should be noted that historic conditions included low flow rates, which may be insufficient to meet the requirements of the Law of the River for water delivery and power production.

2. The construction of Hoover Dam and other dams along the LCR has altered the sediment transport characteristics of the river, which has resulted in the lowering of the

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<sup>5</sup> Controlled releases are releases that occur through the dam structure. These releases can occur (1) by water flowing into the two southern-most intake towers, through the powerplant and discharged to the river, or bypassing the powerplant and discharged from the dam via two tunnels, one on each side of the river, that exits the canyon wall below the dam (referred to as the Canyon Wall Outlets), and (2) by water flowing into the northern-most intake towers, discharged via two tunnels, one on each side of the river, that also exists in the canyon wall below the dam (referred to as the Stoney Gates). The Stoney Gates and Canyon Wall Outlets are only used in an emergency or in flood conditions (USACE 1982). The present powerplant flow-through capacity at Hoover Dam is 49,000 cfs; releases above this amount (up to the maximum controlled release of 73,000 cfs) that are made through the Stoney Gates or Canyon Wall Outlets cannot be used to generate electricity. Hoover Dam has two spillways, one on each side of the river that spill into 50-foot diameter tunnels and eventually discharge into the river. With the spillway gates lowered and the lake at an elevation equivalent to the top of the gates in the raised position (about elevation 1221.4 feet above msl), total discharge capacity of the spillways is 184,000 cfs (USACE 1982). With the lake at the maximum design elevation 1,229 feet above msl and the gates in the lowered position, up to 400,000 cfs can be discharged (USACE 1982).

1 river bed and water surface, thereby substantially increasing the flows needed to achieve  
2 overbank flooding. This change is especially pronounced in the river reaches below  
3 Davis Dam. For example, for a few miles below both Davis and Parker dams, the  
4 sediment-deficient water released from each dam has resulted in degradation (erosion)  
5 of the channel bed, resulting in an incised and armored channel (overall lowering of the  
6 elevation of the channel and increase in the size of the bed material).

7 Hydrologic and hydraulic analyses performed by Reclamation indicate that flows of  
8 50,000 cfs would be the threshold of overbank inundation for most of the undeveloped  
9 portions of the river system (those with natural or unarmored banklines). Conversely,  
10 in other areas of the river, the change in the sediment transport characteristics of the  
11 river has resulted in aggradation of the channel with the deposition of material due to a  
12 variety of reasons including, slowed river flows at the upstream end of reservoirs. This  
13 has resulted in an overall increase in the bed and water surface elevation of the channel  
14 and a reduction in the channel capacity. In the Needles area, the design flood of the  
15 levees is 70,000 cfs; however, due to sediment aggradation, flows above 30,000 cfs cause  
16 property damage (USACE 1982).

17 Property damage and flooding are also a concern along the Parker Strip (the reach from  
18 Parker Dam to Headgate Rock Dam), where the levee design flow is 50,000 cfs, but the  
19 popularity of this reach for recreation and land use planning decisions have resulted in  
20 development that would be damaged at a flow of 19,000 to 20,000 cfs (USACE 1982). In  
21 addition, property damage occurs at flows above approximately 38,000 cfs in the Blythe  
22 area, and at about 16,000 cfs in the Yuma area where development has occurred within  
23 the levee system and a substantial amount of sediment has been deposited in the area  
24 due to the 1993 Gila River flood (USACE 1982; USBR 1997).

25 Flows above these values identified above, or above those imposed by the channel  
26 capacity (approximately 40,000 to 50,000 cfs or greater with the exception of the  
27 limitations noted above) would result in flooding and substantial property damage.  
28 Due to the depositional and erosion characteristics of the river, it is not possible to  
29 release a flow of greater than 50,000 cfs for overbank inundation without causing  
30 substantial flooding and property damage. For example, a release of 50,000 cfs from  
31 Davis Dam would likely result in overbank inundation in the Topock area (where  
32 overbank inundation has the potential to restore some of the sediment transport and  
33 fluvial processes of the river), but would result in flooding and property damage in the  
34 Needles area. Marinas and other recreational facilities along the river could be damaged  
35 by large releases. In addition, flooding in agricultural and urban areas along the river  
36 would result in property damage and increased risk of injury or loss of life. Thus, the  
37 ability of a particular water release to produce overbank flows, continuously wetted  
38 riparian lands, and other effects required to produce beneficial restoration effects is not  
39 feasible under current conditions in the absence of significant damage to the human  
40 environment. In addition, the difference between the historic river flow and current  
41 release rate would result in a substantial difference in the physical characteristics of the  
42 river, such as the amount of sediment transported and the river's ability to overflow  
43 banks (other factors would contribute to the latter, as well). In some reaches of the river,  
44 these changes would be favorable (such as flushing sediment downstream and overbank



scour and deposition that benefits riparian ecosystem functions), while in other areas of the river, these changes may not be desirable (such as deposition of flushed sediment that reduce existing channel capacity).

3. Due to the limited storage capacity of the reservoirs in the LCR system (with the exception of Lake Mead) and the operation of these reservoirs to limit water level fluctuations, large releases from these reservoirs likely could not be re-captured and stored in downstream reservoirs for subsequent diversion by downstream water diverters. Since the water likely could not be recaptured, it would flow over the International Boundary and would be lost to the diverters who have a legal right to the water. This would be inconsistent with the Law of the River. In addition, the loss of the water over the International Boundary would reduce the total amount of water stored in the LCR system, reducing the amount of water available (in that year and in future years) for diversion by those who have a legal right to the water<sup>6</sup>. These releases would also result in a loss of potential power generation, because a substantial amount of water released would likely have to be released through the spillways of the LCR dams and would not generate power. Depending on the amount and rate of flow over the International Boundary, flooding and property damage could occur in Mexico as a result of these releases.

#### 2.2.1.2 *Alternative B: Dam Removal*

This alternative would include the removal of the dams along the LCR for the benefit of species and as a mechanism to enhance and restore habitats throughout the planning area. The concept of removing the dams along the LCR was eliminated for a number of reasons:

System-wide dam removal would essentially eliminate the use of Colorado River water for municipal, agricultural use in both the United States, particularly in the major metropolitan centers of Las Vegas, Los Angeles/San Diego, Phoenix, and Tucson, and Mexico. Loss of this water and power resource would reduce the current overall capacity of these nations to produce goods and services. It also could result in the relocating of approximately 25 million residents who depend on this water supply for domestic uses, which would increase environmental impacts to other communities. Additionally, the agricultural production derived from farming enterprises in the Mohave, Parker, Palo Verde, Cibola, Yuma, Imperial, and Coachella valleys would be curtailed, if not eliminated, because of lack of reliable water supply, resulting in billions of dollars of economic impact to the local, regional, and national economies. Removing the dams also would prevent the management of water flow to generate hydroelectric power. Removal of dams would also eliminate existing reservoirs and associated water-based recreation in these reservoirs, resulting in a substantial economic loss for many communities along the river.

System-wide dam removal would result in the re-establishment of pre-development river flows (refer to Figure 2.2-1 for pre-development river flows). Under this alternative the ability to

<sup>6</sup> Under Article 10(b) of the 1944 Water Treaty, Mexico was allotted "any other quantities arriving at the Mexican points of diversion." Any mainstream Colorado River water that reaches Morelos Diversion Dam is under the jurisdiction of Mexico, and is no longer available for diversion or consumptive use by water users in the United States.

1 regulate river flows, including the reduction of peak flood flows, would be lost. Because river  
2 flows would essentially be “uncontrolled,” and because the levee system would not be able to  
3 protect existing communities and agricultural areas along the LCR (refer to number 2 of section  
4 2.2.1.1, above, for limitations of the existing levee system), substantial flooding would occur.  
5 Removing the dams would have a substantial effect on the human habitation and use of the  
6 riverine corridor along the LCR. Many communities, Indian reservations, and major  
7 agricultural districts are located within the historic floodplain of the LCR, predominately, from  
8 Davis Dam to the SIB. Removing the dams and subsequent restoration of the pre-development  
9 hydrograph would dramatically limit or eliminate all of these uses, again with severe economic  
10 consequences to the regional and national economies.

11 Substantial technological considerations such as the physical disassembling of the dam  
12 structures and power facilities, and environmental considerations such as removal of sediment  
13 trapped behind the dams and restoration of a substantial amount of area previously inundated  
14 would need to be overcome. Moreover, Alternative B would be extremely costly and would  
15 conflict with the Law of the River since it would remove dams that were authorized for a  
16 number of purposes, including river regulation, flood control and protection, improving  
17 navigation, providing for the storage and delivery of water, and for the generation of electrical  
18 energy. Dam removal would require significant new or amended legislation, modifications to  
19 the 1944 Water Treaty (which required the construction of Davis Dam), and would also require  
20 modifications to various other components of the Law of the River.

21 Dam removal would result in considerable changes to the current ecosystem, which has  
22 developed in response to the hydrologic regime imposed by the dams. Flows would become  
23 more variable and seasonal, and it is possible that large areas of existing vegetation could be  
24 eliminated by flooding. It also is possible that some currently vegetated areas that are sustained  
25 by releases from the dams would dry up. Some areas could be colonized with native species,  
26 such as cottonwood-willow; however, this probably would not prevent invasive species such as  
27 saltcedar from attaining dominance.

### 28 2.2.1.3 *Alternative C: Removal of Banklines, Levees, and other Modifications to the Lower* 29 *Colorado River*

30 Alternative C was eliminated for a number of technical, social, economic, environmental, and  
31 legal reasons. The ability or inability to remove or otherwise modify existing bankline  
32 stabilization structures to permit periodic flooding of the former river channel and floodplain  
33 terraces is constrained by numerous factors affecting the modern LCR channel. Principal  
34 among these factors is the reduction in peak discharge from historical rates caused by  
35 impoundment, which has altered the sediment transport characteristics of the river. As  
36 described under number 2 in section 2.2.1.1, this has result in degradation, incision, and  
37 armoring of the channel in some areas, and aggradation of the channel in other areas.  
38 Degradation of the channel has sharply reduced the potential for river stage to rise to an  
39 elevation sufficient to flood riparian plant communities during an appropriate season.  
40 Conversely, aggradation of the channel has increased the potential for the river stage to rise to  
41 an elevation sufficient to flood riparian plant communities during an appropriate season.

42 The areas of degradation and aggradation of the channel do not necessarily correspond with  
43 areas where overbank flooding would be desirable. Additionally, the relatively consistent

maximum dam releases have resulted in a well-defined river channel making overbank flooding under the normal operations of the river extremely infrequent. Under these normal operations, the removal of banklines, levees, and other channel modifications would result in a limited amount of additional overbank flooding and would have minimal benefits for riparian plant communities. However, these features were constructed to protect surrounding communities and farmlands from flooding, and under higher than normal dam releases the removal of banklines, levees, and other channel modifications would result in overbank flooding that may benefit riparian plant communities but could result in substantial property damage. If the existing bankline and levee system were removed, property damage would occur at lower river flows (since the banklines are not there to help contain and redirect flood flows) than those identified under number 2 of section 2.2.1.1. Additionally, removal of banklines, levees, and other channel modifications would not be consistent with the Law of the River, and specifically with the Colorado River Front Work and Levee System Act, which authorized the construction, repair, and preservation of public works on the Colorado river for the purposes of controlling floods, improving navigation and regulating the flow of the river.

Removal of bankline stabilization has shown potential as a means of river restoration for rivers with favorable hydraulic gradients. Unfortunately, those favorable hydraulic profiles do not exist on the LCR and significant uncertainty exists regarding the potential effectiveness of using this approach alone for restoration. The response of the river to stabilization after completion of Hoover, Parker, and Davis dams provides insight into the potential effectiveness or ineffectiveness of simply removing stabilization works as a means of restoring riparian habitat on the LCR. Review of a sequence of historic aerial photography of the river enables a qualitative assessment of the response of the river to the reduced flow regime with and without levee and bankline stabilization to be performed.

The report prepared for *RPA Provision No. 14: Synthesis of Ecological Restoration Concepts for the Lower Colorado River* (CH2MHill 1999), described a qualitative assessment of the potential response of the river in near Parker to the reduced flow regime resulting from the construction and operation of Hoover Dam with and without bankline stabilization. The report evaluated the ability of a non-stabilized section of the LCR to meander from 1902 to 1997; banklines in this area were not stabilized or modified until approximately 1995.

The analysis demonstrated the uncertainty about the effectiveness of bankline stabilization removal as a restoration technique in the LCR. A comparison between the 1902 depiction of the river and the 1942 aerial photograph clearly illustrates that high flood events in conjunction with tremendous sediment loads were fundamental to the reshaping and reconfiguration of the river. Since that time, the 1983 event was the only flood of magnitude, and the river has shown little variation in location and size. Channel widths have remained the same or are narrower, and the channel locations have not changed. The report concludes that:

Without the hydraulic influence of extreme floods and high sediment loads, little change in channel morphometry can be expected, and none of the fluvial processes important to natural riparian habitat dynamics can take place (e.g., point bar and meander formation and channel erosion and aggradation). These results point to the limitations inherent to attempts to reflood the river floodplain of the LCR [lower Colorado River] under the current hydrologic regime. These

1 results can be extrapolated to other stabilized reaches of the LCR [lower  
2 Colorado River] (USBR 1999, page 2-6).

### 3 **2.2.1.4 Alternative D: Use of Conserved Water for Environmental Uses on the Lower** 4 **Colorado River**

5 The key elements of this alternative include (1) the implementation of water conservation  
6 measures, (2) development of other water supplies for delivery to these districts, and (3) the  
7 dedication of the conserved Colorado River water to instream and other environmental uses.  
8 This alternative has been eliminated for the following reasons.

9 Due to competing demands for water and increasing environmental concerns, the affected  
10 water districts are already implementing a variety of water conservation measures and  
11 developing alternative water sources. Representative types of measures that are being  
12 implemented in urban areas include: water conservation, including the use of BMPs, increased  
13 storm water conservation through increased levels of groundwater replenishment; enhanced  
14 local groundwater recovery; desalination; regional surface reservoir storage; water marketing  
15 from other sources; and water recycling. Conservation measures implemented in agricultural  
16 areas include measures such as laser-leveling of fields, multi-sloping of fields, the use of drip  
17 irrigation, irrigation scheduling, water measurement, soil moisture measurements, conveyance  
18 lining, and fallowing. Even if additional conservation measures were implemented, it may not  
19 be feasible to apply additional water for habitat conservation because more Colorado River  
20 water is currently allocated than is available. Moreover, if additional conserved water were  
21 made available, it would go the next priority use and would not be available for habitat  
22 conservation.

23 Additionally, this alternative would not be consistent with the Law of the River. Under the Law  
24 of the River, and specifically, under Article II of the Decree, the Secretary is enjoined from  
25 releasing or delivering water other than to water users in the United States with valid contracts  
26 made pursuant to Section 5 of the BCPA, or to specified Secretarial reservations of water. The  
27 Law of the River requires water to be “beneficially used as reasonably required” (see 44 C.F.R.  
28 Part 417), and does not recognize instream flows a beneficial use of water. Additionally, based  
29 on the Law of the River, any water not used by one Lower Division State can be used by  
30 another Lower Division State. Likewise, within each Lower Division State, any water not used  
31 by one Colorado River Contractor can be used by another Colorado River Contractor within the  
32 state, up to the Contractor’s contracted amount, based on the specific allocation of Colorado  
33 River within that particular state. Overall, a larger amount of Colorado River water is  
34 contracted for than is available for diversion under normal years. Instream flows for  
35 environmental uses would require that all Contractors in the Lower Division States and the  
36 Lower Division States themselves forebear their right to use this water.

### 37 **2.2.2 Alternative Conservation Plans**

#### 38 **2.2.2.1 Alternative E: Larger-Scale Conservation Plan**

39 This alternative was developed by the Service in the course of defining the proposed action. It  
40 would not attempt to restore the LCR to its pre-development state; rather, it would conserve  
41 lost and degraded habitat through the restoration of viable, self-sustaining populations of

native fish and wildlife species to the river's ecosystem. This strategy would be focused on ensuring that native species are present in the river's ecosystem in sufficient numbers to ensure that they are part of the ecosystem and are not maintained strictly as refugia populations. This strategy would construct reasonably large patches of suitable habitat for riparian, marsh, and aquatic species spread up and down the river connected by pathways for migration. A total of approximately 70,000 acres of established or protected habitat would be established for the target species. Patches could be located along the LCR or in nearby areas, such as the Bill Williams and Virgin rivers. Fish species covered by this alternative include the bonytail, razorback sucker, pikeminnow, desert pupfish, and flannelmouth sucker. This alternative also would provide conservation for the following bird species: Yuma clapper rail, southwestern willow flycatcher, yellow-billed cuckoo, and black rail.

This alternative was eliminated for a number of reasons. First, there is not a requirement for the LCR MSCP to provide for the recovery of listed species; therefore, this alternative provides more conservation than is needed, and the costs would be so high as to render this alternative infeasible from an economic standpoint. (Based solely on the amount of acreage involved, costs are estimated to be between eight and nine times those of the Conservation Plan.) Since substantially more conservation would be required than under the Conservation Plan, it would not reduce or eliminate the significant impacts of the proposed action to agricultural resources, air quality, biological resources, cultural resources, and noise. Rather, it would result in greater construction-related or long-term impacts on these resources, as well as on environmental justice, hazards and hazardous materials, hydrology, Indian Trust Assets (ITAs), recreational resources, socioeconomics, topography, geology, and soils, and it could have greater impacts on Mexico (transboundary impacts).

#### 2.2.2.2 *Alternative F: Shorter or Longer Permit Duration*

This alternative was eliminated because it does not meet the project goals and objectives. The Service's Five-Point Policy for HCPs (65 FR 106, June 1, 2000) identifies factors to consider when determining the duration of incidental take permits, including:

- The duration of the covered activities and effects on covered species;
- The time required to implement and acquire benefits from conservation measures; and
- The period that may be required to develop sufficient information through monitoring and research to address biological uncertainties.

Shortening the permit duration (e.g., to 25 or 35 years) was rejected because many of the covered activities are ongoing and continuing annually, and it takes time for replacement habitat to develop. A lesser period of time might not allow for implementation of covered activities or the successful implementation of the conservation plan. Increasing the permit duration (e.g., to 75 or 100 years) was rejected because of the uncertainties involved with implementing a conservation plan so far in the future. Fifty years was selected as a reasonable period of time for forecasting, planning, and implementing the Conservation Plan.

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